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Telephony.

THE AMERICAN TELEPHONE JOURNAL

PUBLISHED EVERY SATURDAY.
TELEPHONY PUBLISHING COMPANY.
VOLUME 71, No. 4.

CHICAGO, JULY 22, 1916.

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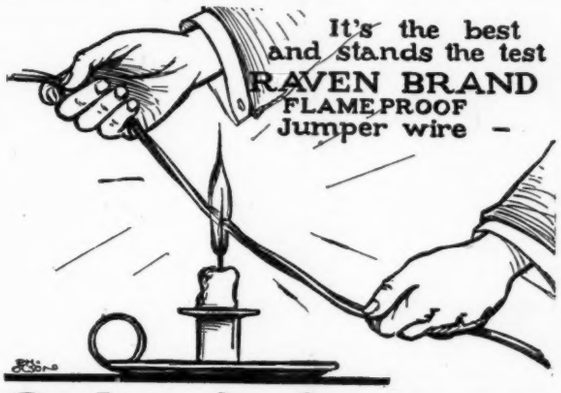

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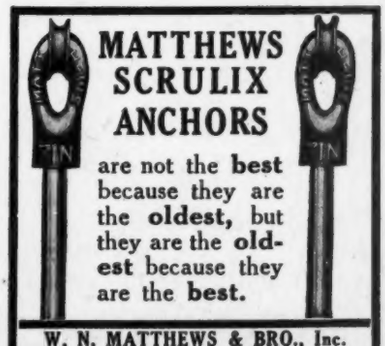
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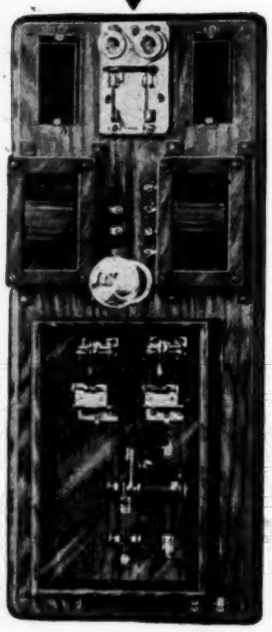

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Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves

PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY
MONADNOCK BLOCK, CHICAGO

H. B. McMEAL, PRESIDENT AND EDITOR. H. D. FARGO, SECRETARY AND TREASURER. J. C. KELSEY, VICE-PRESIDENT AND FINANCIAL EDITOR.
S. R. EDWARDS, MANAGING EDITOR. J. R. HASTIE, VICE-PRESIDENT AND ADVERTISING MANAGER. W. E. RAYMOND, SUBSCRIPTION MANAGER.

Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1897

Volume 71
Number 4

CHICAGO, SATURDAY, JULY 22 1916

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada; $5 Other Countries

Bill the Troubleman says:

"The wise guys say that this is an age of specialization. If that's true, why doesn't the Bell telephone company stick to the operating end of the business and stop merchandizing?"

How the Bell Milks the Public.

There is one phase of the Bell Telephone-Western Electric union to which the Federal authorities should pay particular attention. That is the relation which this alliance bears to the rates which the Bell is charging telephone users all over the country. TELEPHONY believes that the company which furnishes telephone service to a community is entitled to and should receive ample compensation for its part in serving the public. In many cases existing rates should be increased. In many other cases, however, the Bell is overcharging the public, and the reason lies in the present unfair alliance between the American Telephone & Telegraph Co. and the Western Electric Co., its factory.

The milk in the cocoanut is seen right here: To the associated Bell companies the Western Electric charges enormous prices for equipment and supplies. This piles up the cost of operating, enables the companies to show a big expense account and furnishes them with an argument to state commissions why telephone rates should be kept up. In the end, the public foots the bill.

The Bell operating companies no doubt know they are being bled by the Bell factory. But what is the difference so long as the total bill is passed along to the public which pays the freight in high rates based upon the swelled factory prices? Besides, whatever profits the Western Electric makes go back to the Bell, its owner. It's as good a "sure-thing" game as Blackie Daw ever worked at a street carnival in a "hick" town.

From inside information which we have every reason to believe authentic, it is known that, acting as purchasing agent for the Bell associated companies, the Western Electric Co., for handling supplies it does not manufacture, charges the Bell the cost plus 5 or 6 per cent. profit. However, for telephone equipment that it does manufacture, it is said that the Western Electric charges the Bell companies prices which yield an immense profit. We have heard that profit from associated companies estimated as high as 200 or 300 per cent. Not being in the secret we cannot vouch for this statement, but it is known to be a fact that the Bell operating companies pay top prices for their equipment. This is not to be wondered at. There are two reasons:

First, there is no competition. The Western Electric is handed the Bell business no matter what other manufacturers would bid.

Second, the Bell organizations are willing to pay high prices because it helps to keep up operating rates. Besides, the profits earned by the Bell factory flow into the Bell coffers. It is the public which pays the freight.

Federal and state commissions exist, supposedly, for the protection of the public. If the Bell is padding its expense accounts to maintain high telephone rates, the authorities should get busy and bring this telephone-operating and telephone-manufacturing monopoly up with a round turn.

The fact that the same interests own both the Bell and the Western Electric, makes the situation all the more intolerable. They work together like the "tall and short men" who made a record for robbing pedestrians in Chicago a few years ago. One member of the Bell family—the Western Electric Co.—robs another member—the associated company—which then demands recompense from the public in the way of high rates, while the head of the house—the A. T. & T.—collects toll from both. Surely, this is a game which should be suppressed by the authorities.

The Bell should be compelled to play fair. It should buy in the open market, as all other common carriers do.

Then the prices it pays for equipment and materials would form a just basis on which to base the rates it charges the public for telephone service. If the Bell telephone corporation bought in a competitive market, the pernicious activity of the Western Electric Co. in the Independent field would not work such an outrage on the manufacturers in that field. As a matter of fact, if the Bell factory had to compete on the square with others for Bell business, it would not have the time and money to waste seeking Independent business.

The Bell factory loses money on Independent trade now. It is only the fat, juicy orders received from the Bell companies that enables it to continue its poaching. Reports, coming in from day to day, show that the Western Electric is still after Independent contracts. The indications are that it will require an ax to make them observe the ordinary rules of fair play. Meanwhile Independent telephone interests should not relax in the fight for their rights. What is equally important, steps should be taken to force the attention of the commissions to the point that it is this manufacturing monopoly that enables the Bell to ask for high telephone rates in many places.

Cards and Chips

By HERBERT KAUFMAN

Play your cards, not your chips! The size of your stack can't reduce their value. The best hand sweeps the board.

Ability creates capital. You are your own mint. Resolution+ideas=money.

It's nonsense to believe that you are handicapped by empty pockets. Inherited assets, sufficient to permit dawdling, stifle initiative and make a cipher out of many a man who under the spur of necessity, might otherwise have developed into a big figure. When you are unpractised in the processes which produce riches, you are not qualified to protect your holdings from those who have been trained to take advantage of every weak opening.

A bank roll is not a substitute for wisdom. If you have brains enough to conserve wealth, you possess all the qualities necessary to secure it. There wouldn't be nearly so many new millionaires if the old ones had educated their children to be as alert and energetic as they were.

There isn't a private trademark on a dollar in the land—every penny in the country will ultimately drift to capability. There is no enduring poverty except lack of character, purpose, and determination. Subnormals are the only logical paupers.

The frequent quotation of a few parasitic fortunes exaggerates their actual significance. Superficial folk are prone to believe that there exists a static class of plutocrats who control all the chances to make good. Such a notion is a ridiculous fallacy.

In some European countries the continuation of noble orders and pernicious laws of entail centralizes the ownership of vast land holdings and natural resources. But no such system exists on this side of the Atlantic. Here, any man can become as great as his will.

Ninety-nine per cent. of the country's potent figures are—as yesterday and as they will be tomorrow—examplars of the possibilities always open to earnest ambition. Those whose prominence is a hang-over from previous generations are hardly worth figuring—they represent so small a fraction in this or any community.

The great financiers, manufacturers, merchants, professionals, and artists of our time trace their careers back to humble and penurious beginnings. They enjoy no favors or advantages which you cannot obtain. They thought hard, fought hard, and achieved.

You face no greater discouragements than their rebuffs. They simply had your advantages—the early realization of their inevitable course. They knew that they would have to help themselves and while they were at it, they took a liberal helping.

No false ideas of pride or privilege obscured their vision. They began upon a rock-bottom basis and built from the outset on a firm foundation of realities. They tumbled to themselves while still young—before they got far enough to be hurt—and thereafter proceeded without any hampering delusions.

They count for something because they could count on nothing but their personal efforts. A keen man with a clean plan must succeed.

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Wave Distortion and Telephonic Speech Transmission

What Gives Words Their Characteristic Sounds—The Preservation of Exact Wave Form Not Essential to Telephonic Speech Transmission—What Are the Essentials?—Methods of Studying Distortion—How People Understand in Spite of Much Distortion

By E. W. Kellogg

We recognize a difference in the quality of a note as played on a piano, violin, flute, cornet, or other musical instrument. The difference is due to the fact that in none of these cases is the note a pure tone or sine wave, but is a mixture of tones of different pitch. One of the tones—generally the lowest—is dominant and gives the impression that the note, as a whole, is of its pitch, but the other tones are present and have their effect on the quality.

The lowest tone is generally spoken of as the "fundamental" and the others as "overtones." The overtones in musical instruments bear simple frequency ratios to the fundamental; for example, a piano string has secondary vibrations two, three, four and five times as rapid as the principal vibration. The violin string has the same set of overtones but different in their relative strength. While the ingredients of the mixture are the same, they are mixed in different proportions. One instrument may have its notes characterized by a strong second and fourth overtone, and another instrument by a weak second and strong third.

The Nature of Word Sounds.

This explains the different qualities of musical notes, but does not suffice to explain the differences between the sounds used in spoken language.

Two theories have been advanced to explain how speech sounds derive their characteristic quality. They are the "characteristic frequency" theory and the "sound pattern" theory. They will be briefly explained and discussed in their bearing on the question of telephone transmission.

The Characteristic Frequency Theory.

Helmholtz found that in pronouncing vowels, we form the mouth cavities so that they resound to certain frequencies. These frequencies are not sharply defined, but vary between certain limits. An analysis of the curves produced by a recording device when the vowel ä (ah) was sung, showed that no matter to what note the voice was pitched, there was a powerful overtone of a frequency between 650 and 750 and another between 1,000 and 1,200. The following table shows some of the characteristic frequencies as determined by Hermann:

Letter	Example.	—Characteristic Frequency.—
u long	rude	256 to 341 and 576 to 640
o long	rope	512 to 576
a long	ah	650 to 750 and 1,000 to 1,200
i long	machine	2,660 to 2,730
u short	but	512
i short	sit	1,700
m		1,920 to 2,050
s	hiss	960 to 1,150 and 1,540 to 1,920

A study of the action of the vocal cords seems to indicate that they do not vibrate like a violin string with a complete set of overtones, but that they emit short puffs of air at intervals corresponding to the fundamental frequency. Each puff starts a train of oscillations in the resonant cavities of the mouth and nose.

This characteristic permits the production of frequencies independent of that of the fundamental, so that changing the note of the fundamental does not interfere with the accuracy of the vowel sound. If the vocal cords, like the string of a musical instrument, produced a fundamental note with certain overtones whose frequencies were multiples of that of the fundamental, it might often occur that there would be no overtone sufficiently near the characteristic frequency of the vowel in question to produce the necessary resonance in the mouth and nose cavities.

The fact that there is considerable overlapping in the observed characteristic frequencies, and, still more, the fact that a phonograph may be run at different speeds and yet talk clearly, makes it difficult to accept the theory that the distinguishing features of speech sounds are the results of certain frequencies.

The Sound Pattern Theory.

A theory recently advanced by John B. Flowers and presented in a paper before the American Institute of Electrical Engineers, February 9, 1916, is that the manner in which the loudness of a tone varies during a brief interval of time (from about 0.01 to 0.02 second) determines what vowel or consonant is heard. Mr. Flowers obtained a large number of speech wave records by means of a sensitive transmitter and an Einthoven string galvanometer—which is virtually a form of oscillograph

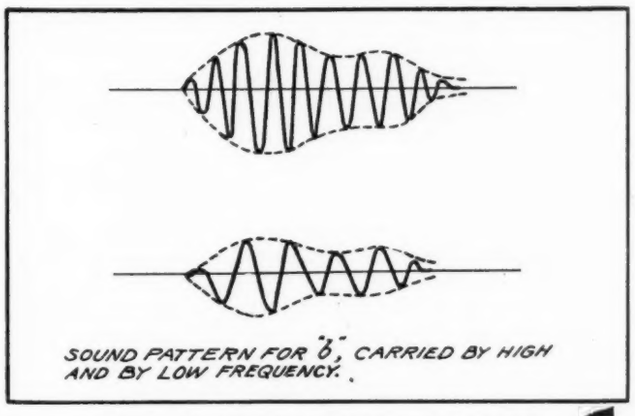


Fig. 1. Speech Wave Record of Letter "b."

adapted to high frequency work—and found that whatever the frequency, each word sound had its characteristic mode of variation in wave amplitude. For example, *b* was characterized by a rapid swelling to a maximum, a slight falling off, rising to a second maximum less than the first and then dying out as illustrated in Fig. 1, the whole taking place in about 0.01 second.

The manner of variation, shown by a curve connecting the tops of the waves, is what Mr. Flowers calls the "sound-pattern." In many cases the pattern was carried by a single frequency while other frequencies were present which had nothing to do with the pattern. This would make it difficult or impossible to recognize the pattern until the pattern frequency was separated out with the assistance of a resonant circuit or by analyzing the wave.

The tone which carried the pattern was sometimes the fundamental voice tone, but more often it was an overtone of anywhere from 500 to 2,500 periods per second. In the case of the consonants *b, d, g, p, t* and *k*, the pattern appeared but once, while with sustained sounds, such as the vowels and the consonants *l, m, n, r, z, f, v* and *s*, the pattern kept repeating itself. Fig. 2 shows a few of the patterns as given in Mr. Flowers' paper.

This theory is easier to reconcile with the fact that a phonograph will talk well at different speeds, than the characteristic frequency theory. It also seems to harmonize quite well with the fact that considerable distortion may take place in a telephone circuit without making the speech unintelligible. This last phase of the question will be referred to later.

It is somewhat difficult to see just how these variations in intensity would be produced, but this is by no means a disproof of the theory. Muscular tremor may account in part for the variations. The clearest case is the sound *r* in which the variation or trill is readily noticeable.

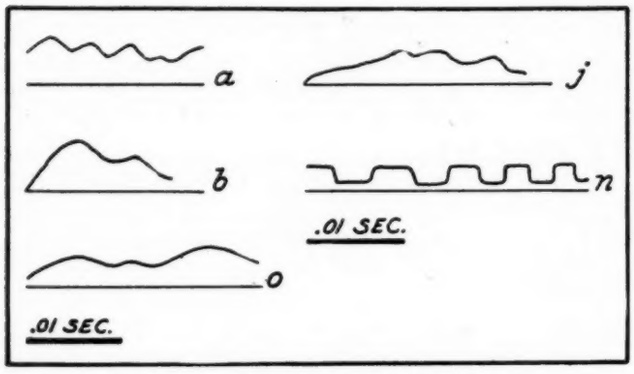


Fig. 2. Sound Patterns of Various Letters.

Studies of Wave Distortion.

The only successful talking devices so far developed (the telephone and the phonograph) depend upon the principle of receiving the sound waves on a diaphragm, and causing a second diaphragm to go through motions which are as close a copy as possible of the movements executed by the first diaphragm.

This amounts to an effort to produce a wave which will have the same *form* as the original speech waves. No such effort is entirely successful; neither is the speech produced by a phonograph or telephone anywhere near as clear and distinct as that of the speaker. This failure to exactly reproduce the form of the original wave is called "distortion," and the effect of distortion is indistinctness and poor articulation.

One of the possible methods of studying distortion is by securing wave curves of original and reproduced sounds by means of recording devices, and comparing their wave shapes, or comparing oscillograms of telephone currents at the sending and receiving ends of the line. This method, however, while of some interest, has not so far lead to results of any value, because a definite connection between the appearance of the wave curve and the sound produced, has been exceedingly difficult to establish. The theory advanced by Mr. Flowers, however, throws more light on this question, and it may be that in the future the direct comparison of oscillographic records will yield more results.

The usual method of studying distortion is based on the fact that *any wave of complex shape is simply the resultant of several pure sine waves of different frequencies.*

In order to reproduce a wave without distortion, the relative amplitudes of the overtones with respect to the fundamental must remain unchanged, and the phase relations must be the same in the reproduced wave as in the original. In order to preserve the original relative amplitudes, the efficiency of the apparatus and circuits must be the same for all frequencies. If, for example, the amplitude of the fundamental has been reduced to one-half the original value, the amplitudes of each of the overtones must likewise be reduced to one-half their former values. This would result in a change such as illustrated by comparing the upper and lower curves of Fig. 3-*A*. In Fig. 3-*B* the overtone has been weakened in greater ratio than the fundamental. This tends to smooth out the wave curve and to rob the sound of its character.

In the transmission of a pure tone (sine wave) of any given frequency, the phase angle by which the reproduced wave lags behind the original wave depends upon whether inertia or elasticity predominates as the motion-restraining factor in the diaphragm vibrations of the transmitter and receiver; whether inductance or capacity predominates in the receiver circuit; upon the inductance or capacity of any apparatus that may be introduced in the circuit; upon the distance, and the velocity with which the wave travels; and upon the presence or absence of reflected waves on the line. Since nearly all of these factors are altered when the frequency is changed, the phase relations of the high and low frequency waves are likely to be decidedly altered in the process of telephonic reproduction.

Experiments to determine the effect of phase changes on acoustic quality seem to indicate that phase has no effect at all* so that quality must depend solely on the amplitudes of the several waves present. This accounts, in part, for the fact that the appearance of the wave curve seems to have so little to do with the quality of the sound. (See Fig. 3-*C*.)

Since the only kind of distortion which has any effect on the quality of sounds is that which has to do with the amplitudes of the several waves present, and distortion of this kind results from the fact that the telephone is more sensitive to sounds of certain pitch than to others, or transmits them more efficiently, we may define distortion as: *"Inequality in the efficiency of transformation and transmission for sounds of different pitch or frequency."*

Besides altering the character of sounds, the telephone generally weakens them. The sound given out by the receiver is feeble compared with that produced before the transmitter. The word *attenuation* is frequently applied to this weakening of the waves, and in particular to the weakening of the telephonic currents in their transmission over the line.

If the characteristic frequency theory is the correct explanation of the nature of word sounds, then to satisfactorily reproduce speech, the telephone must reproduce all sounds in their correct original pitch, and must not eliminate, or unduly weaken, sounds of any pitch corresponding to one of the characteristic frequencies. Since these appear to range all the way from 250 to nearly 3,000 periods per second, all waves between these limits must be transmitted with a fair degree of efficiency. The harm of having a higher efficiency for one frequency than for others, is in the danger of weakening some or all of the characteristic frequency waves, while some of the other less essential sounds come through so strong as to drown out what is left of the characteristic tones.

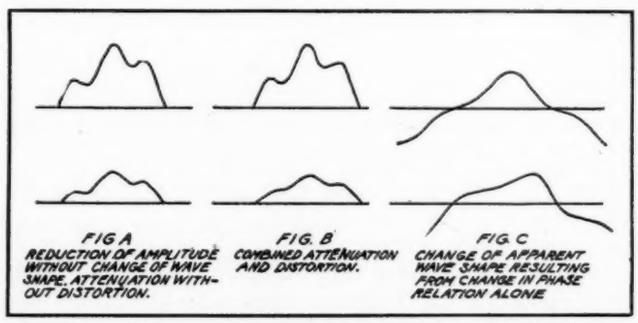


FIG A
REDUCTION OF AMPLITUDE WITHOUT CHANGE OF WAVE SHAPE. ATTENUATION WITHOUT DISTORTION.
FIG. B
COMBINED ATTENUATION AND DISTORTION.
FIG. C
CHANGE OF APPARENT WAVE SHAPE RESULTING FROM CHANGE IN PHASE RELATION ALONE

Fig. 3. Wave Shapes Under Different Conditions.

In the matter of correctly reproducing the pitch of sounds, the telephone is faultless.

The other requirement, namely, equal efficiency for all fre-

*Bulletin by M. G. Lloyd and P. G. Agnew, U. S. Bureau of Standards, Volume 6, No. 2.

quencies within the range of essential voice overtones, is at best only imperfectly fulfilled, and it is to the improving of the telephone and circuits in this respect, that much engineering study and experiment has been devoted. Experience does not show that it is necessary to be able to transmit efficiently waves up to a frequency of 3,000, as the table of characteristic frequencies would seem to indicate, for loaded lines are highly satisfactory, and the practice in regard to the spacing of loading coils is such as to practically eliminate all frequencies above 2,200. The working range is generally considered as running from 100 to 2,000 periods per second.

If the sound pattern theory is accepted, the conclusions in regard to what the telephone must do are practically the same as before, except that fidelity to pitch is not an essential, but a correct reproduction of the original variations in loudness is required. In other words there should be a direct proportionality between the loudness of the sound produced before the transmitter and the sound given out by the receiver. This condition is generally fulfilled.

A number of experimental curves obtained by C. F. Meyer and J. B. Whitehead (Transactions of the American Institute of Electrical Engineers, June, 1912) indicate that the high frequency current output of a transmitter with a given battery current and at any given frequency, is directly proportional to the force which actuates the diaphragm; likewise that the ampltitude of the motion of a receiver diaphragm is directly proportional to the strength of the high frequency current through the windings.

The importance of the necessity for equal efficiency for different frequencies throughout the working range is indicated in the sound pattern theory as well as in the characteristic frequency theory, for the pattern is carried in nearly every case by some one frequency and if this frequency is unduly weakened or drowned out by some other tones for which the telephone is more efficient, the pattern will fail to produce its effect on the hearer. The patterns appeared to be carried by various frequencies ranging all the way up to 2,500 or more periods per second. Therefore, it is only by securing satisfactory transmission throughout this range that clear reproduction of all of the word sounds can be assured.

If some of the higher frequency waves are too feeble by the time they reach the receiver, some of the word sounds will be missed, but enough of the other sounds of the word may be recognized to enable the hearer to get the word. In other words, the inequality in efficiency of the equipment tends to make hearing difficult, but does not necessarily make it impossible.

A striking instance of distortion is that due to diaphragm resonance, both receiver and transmitter showing abnormal sensitiveness at about 700 or 800 vibrations per second. The result is that sounds of this frequency become greatly magnified as compared with sounds of other pitch. This would seem, on first thought, to be a very objectionable form of distortion, but in practice little trouble is experienced from this cause. The explanation may perhaps be that the frequencies between 700 and 800, if they appear at all in the voice waves, are pattern carriers, and therefore magnifying them brings out rather than covers up the distinguishing features of the sounds. If the reasonance occurred at a frequency that was not a pattern carrier, it would seriously interfere with the clearness of articulation.

Hearing.

The mechanism of the ear is so arranged that when a sound reaches the eardrum, the vibrations are communicated, through a set of small bones and a second membrane diaphragm, to the liquid which fills the small cavity called the cochlia. The fibers of the auditory nerve end in this cavity. The mode of operation of this mechanism has never been certainly determined. It appears probable, however, that it would act in such a way that when a complex sound reaches the ear, it is analyzed, and certain fibers of the auditory nerve have their ends agitated at one frequency and other fibers at another, according to what frequencies were present in the sound heard.

Such being the case, it would hardly be expected that the phase of overtones in a sound relative to the fundamental would exercise any influence on the quality of the sound. Experimental evidence points to the same conclusion. This fact has a practical bearing on the telephone art, for as has already been pointed out, change of phase is one of the kinds of distortion which the telephone introduces. The fact that distortion of this kind is harmless, removes one factor which might otherwise cause trouble.

The physiological law that the intensity of the sensation does not vary directly with the energy in the sound waves, is a characteristic of the nerves themselves. Great variations in the intensity with which a nerve is stimulated, produce much smaller changes in the degree of sensation. The sensitiveness of the eye to light, for example, follows a similar law.

If the ear analyzes a sound, and different groups of nerves carry to the brain the sensations corresponding to the several frequencies in the sound, it would follow from the law of nerve reaction just described that considerable changes in the relative amplitudes of the overtones with respect to the fundamental might take place with only slight changes in the quality of the sound as a result. Suppose, for illustration, that the relation between stimulus and sensation is correctly expressed by saying that the sensation varies with the square root of the stimulus, and that a sound consisting of two notes an octave apart, about equally loud, is subjected to some kind of distortion which weakens the upper note to a quarter of its former strength, and the lower note to one-half of its original strength. Instead of being equal, the waves now have a ratio of two to one.

This change would profoundly affect the form of the resultant wave, but in the matter of sensation, the change is much less pronounced, for the sensations produced by the two waves would now be in the ratio of 0.707 to 0.5 (the square roots of one-half and one-quarter) or one exceeds the other by about 40 per cent. This would alter the quality, but not very decidedly.

Distortions of the kind just described are regular accompaniments of the use of the telephone, and the fact that considerable distortion only slightly affects the quality of the sounds means that service can be given at a fraction of the cost which might be necessary were more nearly perfect reproduction of the sounds essential.

Limits of Audibility.

The extreme sensitiveness of the ear to weak sounds is illustrated by the calculation made by Rayleigh, based on experiments in which he produced sound waves of known energy and found the maximum distance at which they could be heard. He concluded that under favorable conditions vibrations of an amplitude of one ten-millionth of a millimeter were audible. A millionth part of a watt suffices to produce an audible sound in a telephone receiver, and most of this energy is used up in the resistance of the windings.

The lowest pitch that can be heard is in the neighborhood of 20 to 25 vibrations per second,—a fact on which depends the success of composite telephone and telegraph operation. The upper limit is not so sharply defined, varying with different people between 10,000 and 20,000 periods per second. It is not ordinarily possible to estimate pitch above a frequency of about 4,000. The maximum sensitiveness of the ear occurs at a frequency of about 3,000. Continuous sounds are not so easily heard as intermittent ones or as sounds which are varying, as the ear seems to become deadened to sounds that are uniform.

Factors Which Assist in Hearing.

The *sequence* of sounds has a decided effect on the impressions they produce. We may analyze a word into a succession of individual sounds, but they seem different when they are put together. For instance ī (as in pride) consists of a broad ā followed by ē (ah-ee), but the combination makes the impression of an entirely new sound. There is not a sharp division between the vowels. As the mouth position is changed, one sound blends gradually into the other, and the glide gives a characteristic impression. That the new sound is not due simply to the intermediate mouth position, but rather to the psychological effect of the sequence, is indicated by the very different effect produced when the order is reversed (ee-ah). There seems to be little in common between the two.

Voice modulations and accent, as well as length of syllables, are of more assistance than we ordinarily think in making words intelligible. It requires close attention and considerable effort to understand the words of even the best singers, especially if the words are new to us. This is because we miss the slight rising and falling of pitch that occurs in ordinary speech, and because the accent and time have been modified.

No study of the subject of the perception of speech would be complete if we neglected to take into consideration what the mind does after the ear has transmitted its message to the brain. Sounds are often entirely missing from a word and their absence not noticed. For example, many speakers omit their R's without their being missed. The explanation is that the mind supplies what is missing. We make an unconscious guess and think we heard it all. If we have a good context to go by, our guesses are good.

The assistance we get from context is illustrated by many common experiences. In listening to someone speaking a foreign language, the only words that sound articulate are those with which we are familiar. We frequently hear a dozen words in succession quite distinctly and then lose the thread of thought, and the speaker seems to be muttering incoherent sounds.

Without context, the unconscious guessing continues, but is wrong a large part of the time. In a test in a Boston public school, for example, words were spoken and the children wrote down what they thought they heard. "Log" was recorded as log, dog, flog, love, long, lack, lull, lock, loud, bog, and many other forms, in each case a definite familiar word. The children were not hard of hearing—they simply had no context. Had the word been a part of a sentence, few of them would probably have mistaken it.

It should be remembered, in connection with the study of hearing, that the *word* is the unit which is recognized, not the elementary sound that helps make up the word. Fluent readers do not see the individual letters. They judge the word from the appearance of the group of letters that make the word, being guided by its length, the first and last letters and the letters that reach above and below the line. In other words, the printed word has a characteristic appearance. Just so in the perception of spoken words, each one has certain distinguishing features, and the more familiar we are with it, the more easily we recognize it. It is not necessary for us to catch all of its elements, but just enough to enable us to fill in the remainder.

The difference in the ease of recognition, due to the greater familiarity of some words than others, makes it necssary in conducting comparative tests of telephone equipment, to avoid many repetitions, and use words of about equal simplicity and that are equally common, or else to eliminate the factor of recognition altogether. This may be done by simply counting or repeating the alphabet, so that the listener knows what is being said whether it is distinct or not, and may center his entire attention on the quality of the reproduction.

The ability to concentrate the attention on certain sounds to the exclusion of others, is an interesting feature of audition, and is a fortunate circumstance for the usefulness of the telephone, where it is sometimes difficult to eliminate all extraneous noises. Examples of this ability are familiar. Boilermakers can hear each other talk amid a din that seems deafening. In a room where several conversations are going on at once, there is no difficulty in hearing any one of them that one may choose to listen to. If the disturbing noises are monotonous, as is true of most of the noises that find their way into telephone systems, there is still less difficulty in ignoring them.

While the mind can concentrate on the speech sounds and not notice the others, so long as the speech is fairly clear and strong, nevertheless in long distance connections, in which it is necessary to work fairly close to the limit of faintness and indistinctness, the noise becomes much more serious, a comparatively small amount of noise being found about as serious in point of making the speech difficult to understand, as the addition of a number of miles of cable to the circuit by which the telephones are connected.

Summary.

The following should be borne in mind in studying transmission:

(1) Distortion in greater or less degree is always present.

(2). The vowels and consonants retain their characteristic sounds through a considerable range of change in wave form, so that a slight distortion would in many cases not be noticed.

(3). Each word sound may owe its characteristics to several factors, and the loss or change of one of the elements in it, while altering the quality, would still leave a sound closely resembling the original.

(4). Some sounds seem to be more rugged than others—i. e., will stand more wave distortion without becoming unrecognizable—and words which are familiar will be recognized provided part of their sounds come through distinctly and the remainder are devoid of character. The substitution of a distinct but wrong word sound would make much more difficulty than the substitution of a sound which has no decided character. Distortion as it occurs in the telephone generally robs sounds of their character without giving them new character or making them resemble new speech sounds.

(5). Accent and inflection are important factors in the recognition of words and these are not dependent on wave shape.

(6). A listener is not likely to become conscious of difficulty in hearing until he begins to miss whole words.

(7). Even the failure to apprehend several of the words of a sentence does not always prevent the listener from grasping the meaning intended, or at least getting a partial idea so that a repetition will make it clear.

For a fuller discussion of speech production and hearing, the reader is referred to E. W. Scripture's Elements of Experimental Phonetics.

To Enlarge Long Distance Office at Troy, N. Y.

A contract has been let for a new three-story addition to the present long distance office of the American Telephone & Telegraph Co., in Troy, N. Y. In view of the completion of the transcontinental line, the business of this exchange has increased to such an extent that it has been found necessary to enlarge the present facilities. It is expected that the building will be ready for occupancy by August 1.

To Build Telephone Line in Columbia Forest.

A telephone line will be constructed in the Columbia forest, state of Washington, by the United States Forest Service, from Dead Horse Ranger station to Twin Buttes, by way of the Niggerheads on the border between the Columbia forest and Rainier forest. The line will be 36 miles in length and will eventually be connected with Guler, Wash., because of the better switching service.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—Part I, Telephone Economics, by James H. Shoemaker, Completed June 26, 1915—Part II, The Corporate Telephone Organization, by J. C. Kelsey and S. R. Edwards, Completed September 25, 1915—Part III, Telephone Accounting and Auditing, by James H. Shoemaker, Completed January 15, 1916—Part IV, Telephone Finance, by J. C. Kelsey and S. R. Edwards, Completed June 3, 1916—Installments Now Being Presented Comprise Part V, Telephone Advertising and Publicity, Written by Roy D. Mock

Quiz Questions on the Preceding Installment.

25. State the purposes of the use of illustrations in advertising. Why should illustrations be carefully selected? What is the present tendency as regards the use of illustrations?

26. Select some newspaper telephone advertisements and criticize them as to white space, balance, borders, printers' rules, and typography.

CHAPTER IV. Advertising Copy.

27. *Function of the Reading Matter of an Advertisement.*—By advertising copy is meant the reading matter or manuscript which goes to make up an advertisement. The layout, the type display, the illustration—all these help to focus attention on the advertisement. But after the attention is attracted, something else is necessary to tell the story—to convince, educate, or instruct the public. The part of the advertisement which does this—namely, the written portion—is referred to as copy.

Most telephone copy is of three kinds—bad, very bad, and awful. The fact that so much poor advertising is put out in the telephone field, and that a considerable portion of it actually pays in dollars and cents, is a wonderful tribute to the tremendous force of advertising. It goes to show what might be accomplished if more care were taken in designing and writing telephone advertisements.

28. *Requisites of Successful Advertising.*—The first requisite of successful advertising is that an advertisement must be seen. That is entirely the mission of the layout.

The second requisite is that the advertisement must be read and understood. This depends entirely upon the copy.

Layout and copy are consequently of equal importance, for if the advertisement is not seen, the best copy in the world will not convince. And even though the advertisement is seen, if the copy does not convince, then it was useless to have attracted the reader's attention in the first place.

Advertising is telling, and the copy is the place to do the telling. Questions of type, display, illustration, and layout are the mechanics of getting the story heard, but the story itself is told in the copy.

29. *The Best Kind of Advertising Copy.*—The best kind of advertising copy is that which tells its story plainly, simply, and without any frills. Extreme literary effects are not desirable in advertising—they call more attention to the style of writing than they do to the story one is trying to tell.

The telephone man who can talk the merits of his system and can portray the advantages of telephone service to a hard prospect, can write the best kind of advertising—if he only will. The trouble usually is that when he sits down to write his advertisement, he is overcome by the fact that the matter is going to appear in cold type. The result is, he leaves all the forcefulness out of his talk and writes what is really very ordinary advertising copy.

30. *Advertising is Selling by Written Words.*—Any man who can sell can write an advertisement, for advertising is selling by the written method instead of by word of mouth. But before he can write it, he must forget that he has changed his medium of expression from talk to type and think only of the prospects at the other end of the newspaper who are going to read his story. Make no mistake about this. There is no magic in writing an advertisement—it is just selling talk set down on paper.

One reason one advertisement is better than another is because the writer of one is a better salesman than the creator of the other. It is either that or the fact that he knew how to forget himself when it came to setting down his arguments in black and white.

31. *The Things to Know Before Writing an Advertisement.*—Obviously before writing a telephone advertisement one must have something to say. A man who has nothing to say about his business had better stop advertising until he can find something to say. It is far better to do that than to waste money.

When a man has analyzed his business so he has clearly in mind what the chief selling factors or arguments are, then he is in position to write advertising that will pay. When he knows these things, let him tell them—tell it to the readers of the newspaper in good straightforward talk—the frank, above-board, honest kind that rings true and convinces.

32. *Essentials of Copy.*—Be brief. Brevity is not only the soul of wit, but it is the very life of advertising. Advertising space costs money and to fill up space with useless words is poor business. Better have fewer words and have them set in larger type with more white space around them.

Condensation is the order of the day in advertising. But condensation does not mean leaving out essential portions of the story. It means getting them all in, but in few words. An advertisement of 100 words should make the reader think 1,000 words.

Be natural. The kind of copy that is most easily understood, is the simple, natural sort that tells its story in a few words and then quits. If you are writing your own copy, do not try to write like someone else. Write like yourself.

33. *Styles of Advertising Copy.*—To attempt to classify the different styles of advertising copy would be almost like making a directory of all the people who ever wrote an advertisement. Each man has his own way of telling a story. But examine current advertising with a critical eye and it will be found that there are certain general types of advertising copy used.

First, there is the intensely personal type which speaks entirely in the first person. An advertisement of this type purports to be written by the man who signs the advertisement—usually the head of the company. This style of copy possesses a great deal of "punch" for, somehow, it is easier to get snap and ginger into one of these "I" pieces of advertising than it is where one has to talk about an impersonal object such as a telephone; or about some indefinite kind of service, such as telephone service. In other words, there is a great deal of red blood in it. An example of this kind of advertising is shown in Fig. 23.

—"*Keep Home-Made Money Home*"—

"Fighting the Telephone Trust"—No. 3

Why Competition Is Necessary

In my second statement of this current series explaining how competition is your necessary protection from the evils of the great Telephone Trust, I gave a brief history of the American Telephone and Telegraph Company, of which Pacific is a part. I also stated that (1) until competition by independent telephone companies set in, the Trust did nothing to develop the telephone territorially, except in congested business districts, (2) only through competition came improvement in service or equipment, (3) competition is responsible for the reduction in rates which put telephones within the means of everyone.

A Concrete Example

This statement takes up the first point, to prove to you concretely how competition extended the territory served. The experience of Toledo, O., will serve as a fair example of what happened all over the country. Here the Trust exercised a monopoly, and, as usual, its policy was to serve merely the congested business districts close to the telephone exchange. There profits were greatest, because the Trust was spared the expense of building and maintaining long extensions to connect with scattered customers. If you wanted a phone outside this narrow district, you had to pay the cost of construction of lines, etc., in addition to exorbitant service rates. Yet the Trust owned the lines! None but the wealthy could enjoy the luxury of a residence phone.

Home Phone Protects You

What a change competition brought! Toledo had a population of 130,000, but only 3100 telephones—practically all in the business district. Within two years after the Independent Telephone Company started, Toledo enjoyed the use of 21,000 telephones, practically seven times what it had before. 12,000 were Independent phones and 9000 Bell instruments. Note that competition forced the Trust itself to treble the number of its phones, the majority being installed in the residence districts. Competition also reduced the rates until a telephone was within the means of everybody—no longer an expensive luxury, but a necessary convenience! Wherever competition has been suppressed, the Trust has returned to its former selfish policy. San Diego can not afford to be without the protection of competition!

For Home Phone Installation Call 3100

Charles E. Skinner

President San Diego Home Telephone Co.

"*Private Line—Secret Service—Residence Phone $1.50*"

Fig. 23. Example of the Personal Type of Advertisement.

34. *The Personification Type of Copy.*—In Fig. 24 is exhibited a very good example of what might be called the "Personification" type of advertising. It raises the telephone from an inanimate object to the level of intelligence—able to speak for itself. Such advertising is good only occasionally.

Listen!

I AM THE HOME TELEPHONE!

Miracle of mechanism!

The product of master minds devoted to years of scientific toil.

My brain is an organization of 1,000 people directed by the highest electrical and mechanical engineering talent.

I am the carrier of the city's daily speech.

Distance I know not. I flash, instantaneously, through miles of space, the spoken thought of mankind.

I am swiftest and surest of messengers. My speed is that of the lightning.

My accuracy is absolute. I speak exactly what I am told to say.

I ask no rest. By day, by night—always—I am on duty.

I am essential to the city's social and business life. I do the housewife's shopping because I bring the store to her. I keep her in touch with the children in school. I have largely supplanted the written word as a social and business factor.

I am the protector of the home. While the city sleeps I am on guard, alert, ready to meet any emergency.

There is mystery and magic in my mechanism. No man can forecast the character of the message that my ring may mean for him. Success, wealth, opportunities for achievement lie just behind the vibrator of my receiver. All human emotions I encompass.

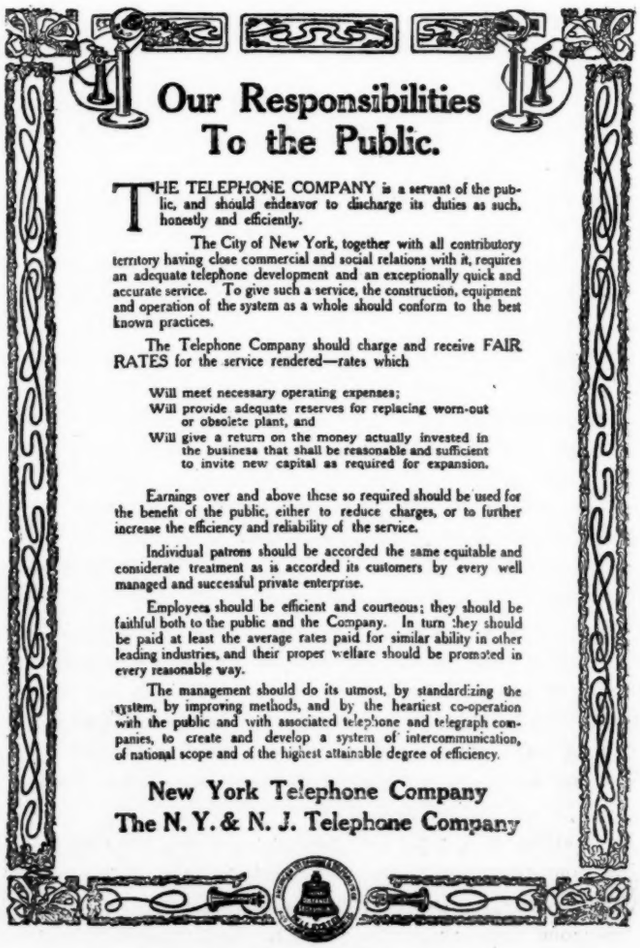
My mission is helpfulness. My ambition is to serve.

I AM THE HOME TELEPHONE I GIVE THE MOST AND BEST TELEPHONE SERVICE FOR THE PRICE. JOIN MORE THAN THE 45,000 OTHERS TO WHOM I AM GIVING INDISPENSABLE SERVICE.

THE KANSAS CITY HOME TELEPHONE COMPANY
and the
KANSAS CITY LONG DISTANCE TELEPHONE COMPANY

Long Distance Quick—"Use the Home."

Fig. 24. Personification Type of Copy.



Our Responsibilities To the Public.

THE TELEPHONE COMPANY is a servant of the public, and should endeavor to discharge its duties as such, honestly and efficiently.

The City of New York, together with all contributory territory having close commercial and social relations with it, requires an adequate telephone development and an exceptionally quick and accurate service. To give such a service, the construction, equipment and operation of the system as a whole should conform to the best known practices.

The Telephone Company should charge and receive FAIR RATES for the service rendered—rates which

Will meet necessary operating expenses;
Will provide adequate reserves for replacing worn-out or obsolete plant, and
Will give a return on the money actually invested in the business that shall be reasonable and sufficient to invite new capital as required for expansion.

Earnings over and above these so required should be used for the benefit of the public, either to reduce charges, or to further increase the efficiency and reliability of the service.

Individual patrons should be accorded the same equitable and considerate treatment as is accorded its customers by every well managed and successful private enterprise.

Employees should be efficient and courteous; they should be faithful both to the public and the Company. In turn they should be paid at least the average rates paid for similar ability in other leading industries, and their proper welfare should be promoted in every reasonable way.

The management should do its utmost, by standardizing the system, by improving methods, and by the heartiest co-operation with the public and with associated telephone and telegraph companies, to create and develop a system of intercommunication, of national scope and of the highest attainable degree of efficiency.

New York Telephone Company
The N. Y. & N. J. Telephone Company

Fig. 25. Another Type of Personification.

It is an attempt to impress people with the fact that the telephone is a great public benefactor, and a tremendous influence everyday need for the telephone close enough home to most people. They read it, digest it, may believe it, but go on their way without thinking any more about how they, personally, need telephone service.

A similar kind of advertising is illustrated by Fig. 25. It is an attempt to raise the New York Telephone Co. to the rank of intelligence exhibited by human beings. The intention of this advertisement is to prove that the New York Telephone Co. is a great public benefactor which, perhaps,

For Social Arrangements
We'll be over after Dinner.
THE Telephone promotes sociability and good-fellowship, because it brings neighbors closer together, and puts your friends within talking distance of you.
With a telephone in the home it is possible to arrange the most delightful little social affairs at the eleventh hour. The impromptu card party or dance can be quickly gotten up; the guests can be invited, and delay and uncertainty avoided, as the telephone provides the means for an instantaneous reply. Informal invitations received over the telephone are most welcome.
Bell Telephone Service is constantly serving the social needs of 20,000,000 people. Its Local and Long Distance facilities interconnect all.
Have You a Telephone?
NEW YORK TELEPHONE COMPANY
Every Bell Telephone is the Centre of the System.

Fig. 26. A Suggestion of Specific Use of the Telephone.

should be endowed by the state because of its many good deeds.

35. *Advertising Specific Uses of Telephone.*—Fig. 26, also a reproduction of a New York Telephone Co. advertisement, is one of a series which suggests specific uses for the telephone. The Independent telephone man who analyzes conditions in the community he serves, can map out a very interesting series of uses for his particular kind of telephone service. Some of these headings might be as follows:

"Use the Telephone for Finding out if That Train is on Time."

"For Getting the Doctor in a Hurry, Use the Telephone."

"Get your Threshing Gang by Telephone."

"Order Your Groceries over the Telephone."

"Telephone New Year's Greetings to Your Friends."

A series of advertisements of this kind would undoubtedly prove effective and helpful. They would not only point out specific uses of the telephone, but they would make each reader realize more keenly than before his need for telephone service.

(To be Continued.)

Bell Earnings Show 13 Per Cent. Increase.

For the six months ended June 30, the American Telephone & Telegraph Co.'s net earnings, after interest charges were provided for, increased 13.09 per cent. as compared with the corresponding period in 1915. In the five-month period ending May 31, the net income available for dividends of the Bell telephone system of the United States increased 19.32 per cent. For June the increase was 17.82 per cent.

The earnings report of the American Telephone & Telegraph Co. for the six months ended June 30 compares as follows:

Earnings:	1915.	1916.
Dividends	$12,617,898	$13,253,106
Interest, other revenues	6,714,330	6,874,309
*Telephone traffic (net)	3,206,019	4,197,037
Other sources	611,559	859,578
Total	$23,149,807	$25,184,030
Expenses	2,707,179	2,725,156
Net earnings	20,442,628	22,458,874
Deduct interest	3,490,949	3,287,791
Balance	$16,951,679	$19,171,083
Dividends paid	14,250,362	15,425,007
Balance	$ 2,701,317	$ 3,746,076

*One month estimated.

Earnings of the Bell telephone system of the United States—American Telephone & Telegraph Co. and associated companies in the United States, not including connected Independent or sublicensee companies—for the five months ended May 31, compare, all duplications excluded, as follows:

	Five Months Ending May 31, 1916.	Increase.
Total operating revenues	$105,500,128	$10,736,658
Depreciation	19,604,376	1,667,397
Current maintenance	13,416,901	1,174,054
Traffic expenses	21,072,445	2,793,550
Commercial expenses	10,465,035	682,672
General miscellaneous expenses	4,585,460	45,869
Net operating revenues	36,355,911	4,373,116
Uncollectible revenues	678,174	*17,833
Taxes	5,830,429	463,218
Operating income	29,847,308	3,927,731
Net non-operating revenues	2,904,202	398,456
Total gross income	32,751,510	4,326,187
Interest deductions, etc.	9,217,981	248,095
Balance net income	23,533,529	4,574,282
Deduct dividends	†14,448,384	1,120,543
Surplus earnings	9,085,145	3,453,739

*Decrease. †Paid for three months—estimated for two months.

Bell Company to Quit Jefferson City, Mo.

The Bell company will quit Jefferson City, Mo., August 1 and turn its business over to the Capital Telephone Co. The Bell was the first telephone service established in Jefferson City and for years it had control of all the business, local, and long distance. Competition in the shape of a local company, which since has grown to large proportions, put it out of the local business a number of years ago. Its telephones are established in all the public offices and will remain, but the exchange of the company, so long maintained, will be discontinued.

Digest of Telephone Articles in Various Publications

Prepared by Arthur Bessey Smith

TELEPHONOMETRY, by B. S. Cohen. The Electrician, (London), May 26, 1916, pages 244-245, and June 2, 1916, pages 277-279; two diagrams, three curves; two drawings, five views, two tables. Abstract of paper read before Institution of Post Office Electrical Engineers.

The author refers to methods of transmission measurements

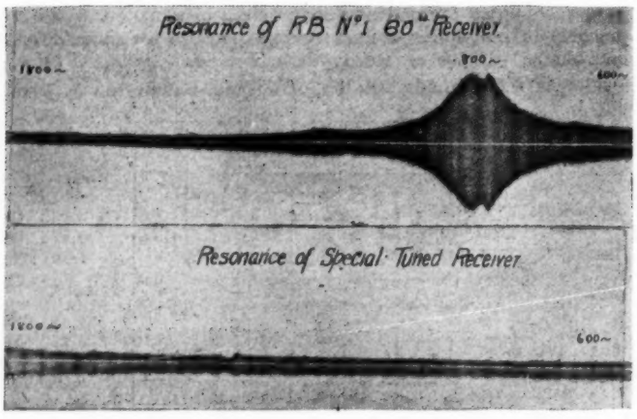


Fig. 7. Resonance Curve.

by pure wave currents and by standard cable comparisons, using the voice and ear. The essentials for measurements are standards for sending, receiving, and attenuation of speech. The customary standards for the first two are carefully made, selected, and tested telephone instruments, but attempts have been made to make a more constant transmitter than the granular carbon type. One electromagnetic transmitter is very constant, but has a loss of 42 miles of standard cable (worse than the granular carbon standard).

The standard cable of the British post office has the following constants per mile: 88 ohms, 0.054 mf., 1.0 millihenry, 5.0 micromhos leakance, simple attenuation constant 0.107 at 800 cycles, characteristic impedance 571Γ42° 50′.

When making tests, the conditions of practice should be duplicated as far as possible. Measurements are not always the same on open-wire trunk as on all-cable trunk. For this reason an artificial aerial line totalling 800 miles, is now being brought into use. It is made up in 100-mile boxes. It has the following properties:

	200 lb.	400 lb.
Resistance	9 ohms	4.5 ohms
Capacitance	0.01 m.f.	
Inductance	3.7	millihenrys.

The insulation resistance can be varied from the natural insulation of the ebonite top to 1, 0.5, and 0.1 megohm per mile. Line inductance is wound on toroidal wooden cores. The coils and condensers are lumped eight miles apart. A detailed description is then given of the methods followed in making a test by comparison.

An attempt was made to find a substitute for the voice and ear. It was found that the words "one, two, three, four, five" gave substantially the same results as sentences such as "Mary had a little lamb." Then from oscillograms of the numeral words, a mean wave was obtained combining all these words. An analysis of this wave gave a fundamental of 145 cycles but very small volume; a large sixth harmonic, 20 times the fundamental; and many other harmonics mostly greater in volume

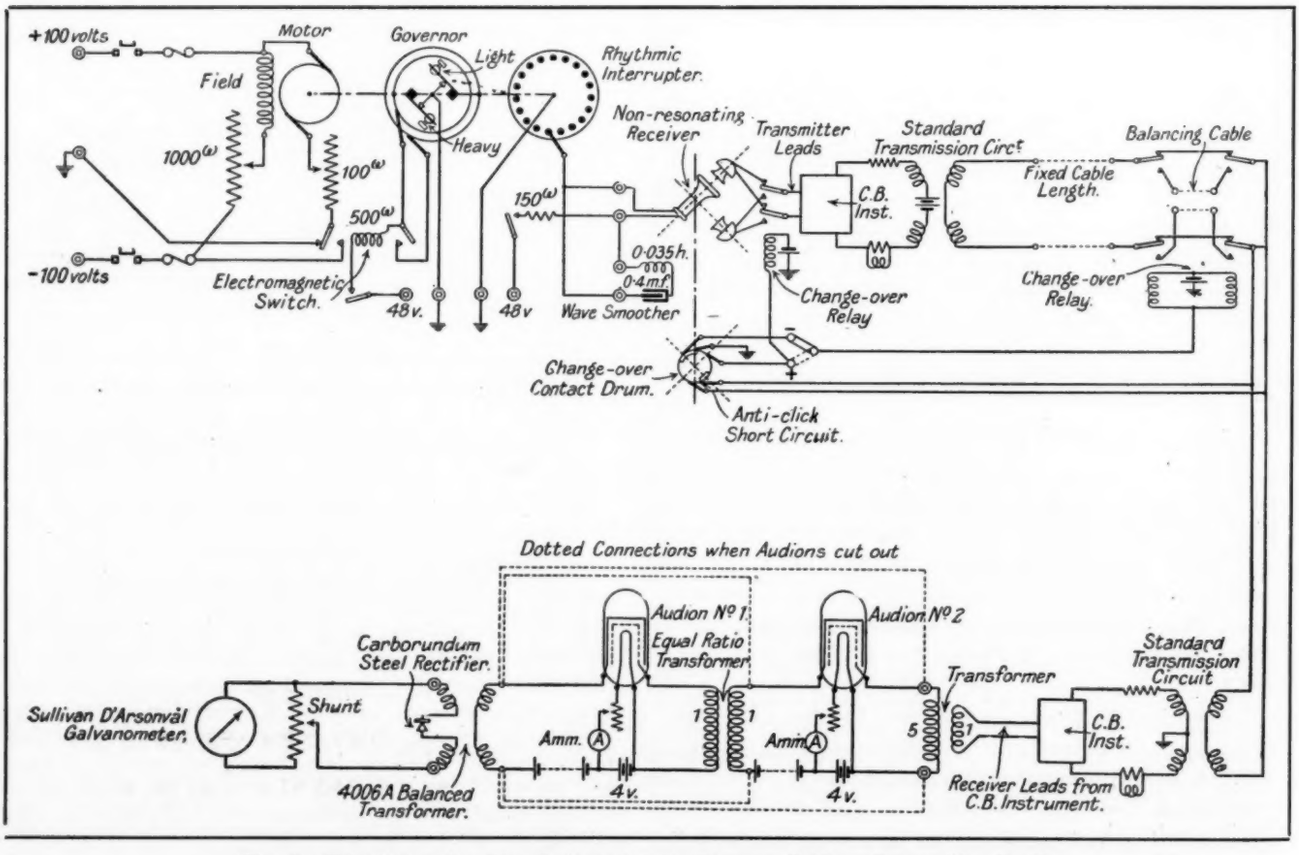


Fig. 8. Telephonometer Circuit Arranged for Common Battery Transmitter Testing.

than the fundamental. It was hoped that a wave representing the fundamental and the sixth harmonic would give results approximating speech. The results were not satisfactory.

THE TELEPHONOMETER: Recently the matter was reopened by trying to generate a wave composed of many frequencies.

Line under test.	Equated length in M.S.C.		
	By speech (mean of a number of balances).	By telephonometer (single test).	By calculation from the measured A.C. constants.
20 lb. artificial cable (No. 5), mica condensers, 20 miles virtual length.	21·4	21·2	21·2
400 lb. artificial aerial line, 200 miles virtual length, insulation resistance 1Ω per mile	6·7	6·4	6·3
The experimental 20 lb. cable, 8 pair multiple twin, 37 actual miles	35·5	35·8	35·2
40 lb. artificial cable, 32 miles virtual length	26·1	26·25	26·2
70 lb. artificial cable, 32 miles virtual length	22·0	21·9	21·95

Table I. Comparisons of Various Types of Lines.

An interrupter was varied in speed at a regular rate so as to go through a complete cycle of frequencies from 700 cycles to 1,400 cycles and back again in 0.7 second. The alternating current generated was delivered to a non-resonating receiver, having no resonance points between 700 cycles and 1,400 cycles. See Fig. 7. This receiver was used instead of the voice to actuate the transmitter under test.

The apparatus used instead of the ear consisted of one or

Transmitters under test.	Relative transmission efficiencies.		Difference S—T M.S.C.
	By speech (S) M.S.C.	By telephonometer (T) M.S.C.	
R.B.1,C.B., solid backs, all compared against C.B. standards—	3 observers, 6 balance tests.		
a	+ 1·3	+ 1·9	−0·6
b	− 2·1	− 2·0	−0·1
c	− 0·8	− 0·7	−0·1
d	− 3·5	− 3·0	−0·5
e	− 1·6	− 1·0	−0·6
f	− 4·0	− 4·0	0
g	− 2·0	− 2·5	+0·5
h	− 1·5	− 1·5	0
Inset transmitters, all compared against C.B. standards—			
k	− 9·0	−10·7	−1·7
l	− 9·0	− 9·2	−0·2
m	− 9·3	− 7·7	+1·6
n	− 9·6	− 9·2	+0·4
o	− 9·8	− 8·2	+1·6
p	− 7·9	− 6·7	+1·2
q	− 9·8	− 8·9	+0·9
r	−10·3	−12·9	−2·6
s	−13·5	−14·2	−0·7
t	− 9·8	− 9·2	+0·6
u	− 8·9	− 6·8	+2·1
v	−11·3	−10·2	+1·1
+ signifies better and − worse than the V.O standards.			

Table II. Results of Transmitter Tests.

two audion gas discharge relays, a steel-carborundum rectifier, and a D'Arsonval galvanometer. See Fig. 8. The weak received current was increased by the relays and deflections read on the galvanometer. Though calibration was possible, the results were secured by getting a deflection on the apparatus under test and an equal deflection on standard apparatus adjusted to give the same delivered current. The complete apparatus is called a telephonometer.

The results on cable testing (Table I) are very satisfactory. When testing transmitters, the most unreliable of apparatus, the results are excellent. A difference of one mile of standard cable is to be expected with common battery transmitters, and if different persons talk, several miles difference may result. The agreement shown in Table II speaks well for the apparatus. No mouthpiece was used, the receiver being placed directly against the transmitter. The ordinary means of measurement still have to be used to determine articulation.

Figs. 7, 8, and Tables I and II.

FORMULAS FOR LINES WITH UNIFORM LEAK LOADS, by A. E. Kennelly. Electrical Review and Western Electrician, June 24, 1916, Vol. 68, No. 26; pages 1149-151, 14 diagrams.

This article receives editorial comment on page 1,139 under

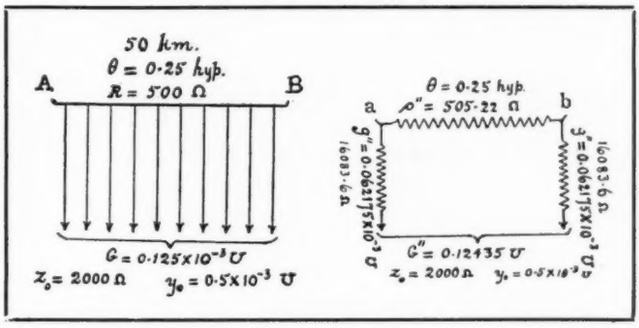


Fig. 6. Unloaded Line and Equivalent II of Unloaded Section.

the heading "Leak Loading of Telephone Lines," calling attention to the lack of work which has been done along this line and suggesting that perhaps its possibilities are not fully known.

Dr. Kennelly states that uniform smooth conducting lines

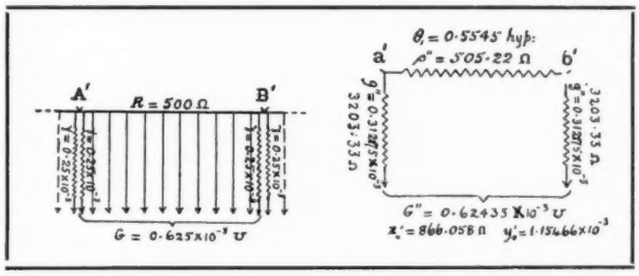


Fig. 7. Leak Loaded Line and Equivalent II of Loaded Section.

may be regularly loaded at uniform intervals with impedance or with leaks. The former is called "series loading"; the latter, "leak loading." Leak loaded lines were suggested by Prof. S. P. Thompson, of London, in 1893, are little known,

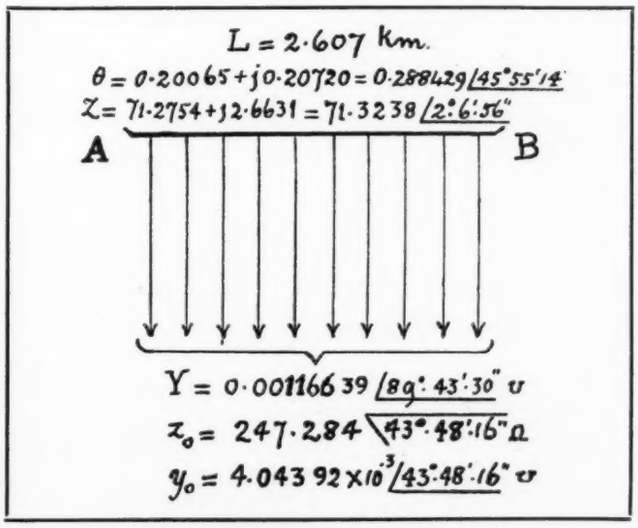


Fig. 9. Unloaded Smooth Section.

but may yet be utilized. In this article, the writer presents two seemingly new formulas for dealing with leak-loaded lines and to show the remarkable parallelism which runs between them and the formulas applying to series loaded lines.

We may develop the formulas for lines having uniform

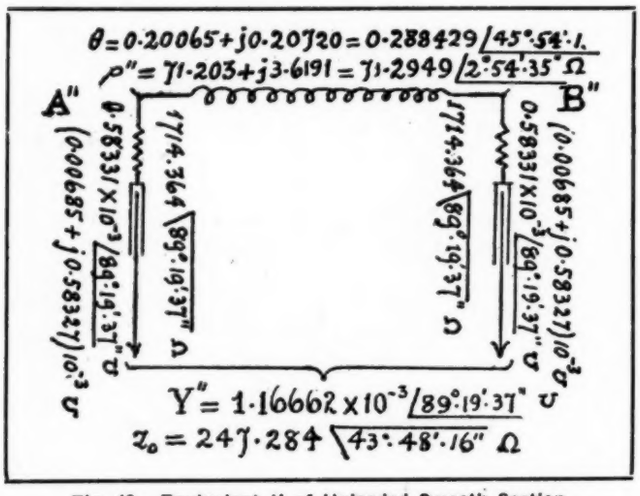


Fig. 10. Equivalent II of Unloaded Smooth Section.

linear conductor resistance and dielectric leakance carrying continuous current in a steady state. These are immediately applicable to steady-state alternating current of a single frequency by interpreting the formulas vectorially. The behavior of such a line carrying direct current (before and after loading with leaks) may be imitated by an artificial line consisting of sections like Fig. 6 and Fig. 7. The methods of calculating the artificial line are given in "Artificial Lines for Continuous Currents in the Steady State" by A. E. Kennelly, Proceedings American Academy of Arts and Science, Vol. 94, page 97, November, 1908. Fig. 6 shows a section of unloaded line, 50 kilometers long, with the equivalent artificial section. Fig. 7 shows the same line loaded with a leak at each end of the section, also the artificial equivalent.

Applying the formulas to steady alternating current, the writer considers a smooth line with uniform sections 2.607 kilometers long, having 27.34 ohms' resistance, 0.202×10^{-3} henry inductance, 2.15×10^{-6} mho leakance and 0.08948×10^{-6} farad capacitance per kilometer. (This corresponds to No. 19 B. & S. gage copper wire, Editor). The frequency is taken to be 796 cycles (p=5,000). Fig. 9 gives the electrical properties of the line, Fig. 10, the equivalent artificial line section, and Fig. 11 the equivalent of the line if it be loaded with leaks. This load reduces the attenuation of the line, but the improvement occurs within but a narrow range of frequency.

The formulas for series and leak loading are shown in comparison with each other.

CAUSES OF TELEPHONE "NOISE" AND ITS ELIMINATION, by Frank T. Coldwell. Electrical World, June 17, 1916, Volume 67, No. 25, one diagram.

The telephone receiver may be considered as an extremely sensitive indicator of change in potential. If a receiver is connected to two wires of the same potential, no noise will be heard, no matter how high the potential. But a very slight difference in the potential of the two wires will cause a current through the receiver and the line is said to be noisy. Unequal potential in the two wires of a telephone circuit may be caused by "weather," "induction" and "static."

Two wires extended across country on insulated supports, will have a certain static potential to ground. This atmospheric charge will depend upon the weather, height of wires above ground, and degree of insulation.

With a telephone line near a power lighting circuit, the equivalent of a transformer exists. The power circuit is the primary and the telephone circuit the secondary. The potential induced in the secondary (telephone line) may cause a current through the telephone receiver and noise will result. If the secondary of the transformer is divided into two sections and connected

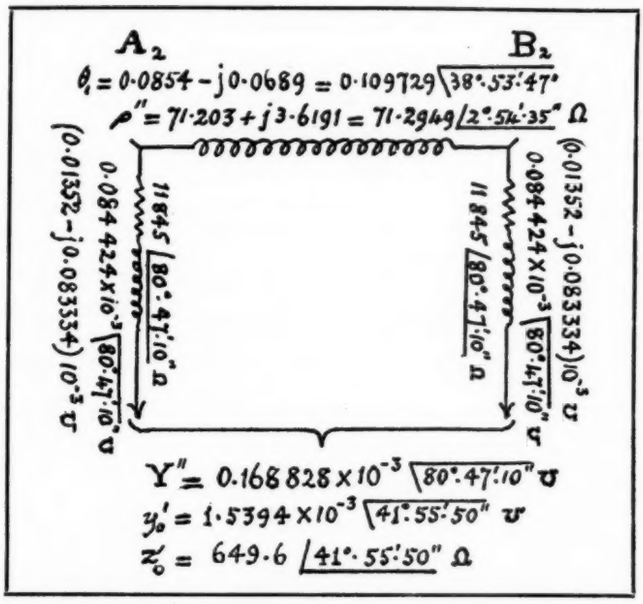


Fig. 11. Equivalent II of Loaded Section.

in opposition, no current will flow in the secondary when an e. m. f. is applied to the primary. This holds for a telephone line also.

In all constant potential systems, the transmission wires have a certain potential to ground, and if a telephone line is placed near it, the telephone wires will receive an induced static potential to ground. If the insulation is good and the telephone wires are either symmetrically arranged with respect to power

Load at junction, $\Sigma=2\sigma$ ohms $\angle$.
Angle subtended by loaded section, θ.
Surge impedance unloaded, z_o.

Surge admittance unloaded, $y_o=1/z_o$.
Auxiliary angle of load, $\delta=\tanh^{-1}(\sigma/z_o)$.
Angle subtended by loaded section, θ_1.

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}$$

$$\cosh\theta_1=\cosh\theta+(\sigma/z_o)\sinh\theta.$$
$$=\cosh\theta+\tanh\delta\sinh\theta.$$

Surge impedance of loaded line measured at any junction,
$z_o'=1/y_o'$.
$z_o'/z_o=\sinh\theta_1/\sinh\theta$.

Series Loaded Line.

$\Gamma=2\gamma$ ..... mhos $\angle$ (9)
θ hyps $\angle$
z_o ohms $\angle$

$y_o=1/z_o$ ..... mhos $\angle$ (10)
$\delta=\tanh^{-1}(\gamma/y_o)$ ..... hyps $\angle$ (11)
θ_1 hyps $\angle$

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}\quad\text{..... (12)}$$

$$\cosh\theta_1=\cosh\theta+(\gamma/y_o)\sinh\theta\quad\text{..... (13)}$$
$$=\cosh\theta+\tanh\delta\sinh\theta.$$

$z_o'=1/y_o'$ ..... ohms $\angle$ (15)
$y_o'/y_o=\sinh\theta_1/\sinh\theta$ ..... numeric $\angle$ (16)

Leak Loaded Line.

lines, or properly transposed, the potential of each wire, due to static induction, will be the same. Undisturbed conversation may be held over the telephone lines, although its potential to ground may be several thousand volts. The line may be drained of the static charges by use of drainage coils and static potential thus lowered.

A telephone transformer is used (a) to permit the use of ordinary wiring and instruments, (b) to protect the operator from shocks due to static charges, (c) to protect the inside wires, instrument, and operator in event of cross between the power conductors and telephone wires. Where the noise is reduced by use of a transformer, it may be found the noise was due to leaks in the inside wiring or instruments. The transformer is not used to prevent noise.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies, Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchises, Rates and Service

Congressional Investigation of Government Ownership.

On July 15, the House of Representatives passed Resolution No. 60, which provides for the formation of a joint sub-committee from the membership of the committees on interstate and foreign commerce of the Senate and the House of Representatives to investigate the effectiveness of the interstate commerce act in the control of telephone companies as well as railroad companies. The paragraph in the resolution which is of interest to telephone men is as follows:

"The committee is appointed to investigate also the subject of government ownership of all public utilities, such as telegraph, telephone and express companies and railroads engaged in interstate and foreign commerce, and report as to the wisdom or feasibility of government ownership of such utilities and as to the comparative worth and efficiency of government regulation and control as compared with government ownership and operation."

The Senate has already passed this resolution and it is practically certain that the bill will now become a law.

The joint sub-committee authorized by the bill will, it is expected, appoint another sub-committee to hold hearings and collect data and report its conclusions to the congressional committee which will undoubtedly adopt the report and recommendations. Thus the question of governmental regulation and control as compared with commission control and regulation will be brought to a head

The joint committee is instructed to report to Congress on or before the second Monday in January, 1917.

Although it is unlikely that anything will be done relative to the hearings of the committee until late fall, the adoption of the resolution brings before the telephone industry of the country an opportunity to present its views on whether or not government or commission control is desired.

In a report of the House committee on interstate and foreign commerce, recommending the adoption of the joint resolution, No. 60, is the following:

"Members of the Interstate Commerce Commission appeared before your committee and advised us as to the tremendous increase in the volume, importance and diversity of its business as well as the difficulties of transacting and disposing of same in a satisfactory manner, suggesting several changes in the law affecting their organization and procedure. Since the approval of the act to regulate commerce in 1887, the system has had a gradual and irregular growth by various and sometimes sporadic amendments, some of them making decided, if not radical, changes in the original plans and policies and some of them adding new and important activities. So that the entire law to regulate commerce now in force is not a uniform, compact, symmetrical structure, easily understood, but is an incoherent growth, sometimes inconsistent, in some parts hardly reconcilable, and, to say the least of it, the diversities and incongruities should be carefully considered and wherever possible unified and improved, to the end that the Federal regulation of carriers may be successfully carried on with the best possible service to the public.

The improvement of the telephone and telegraph, both wired and wireless, and the operations of the express companies and the connection of our local transportation system and foreign traffic, all having grown up or undergone changes in recent times, are worthy of study, and demand in the interests of the public service, through consideration.

The various subjects mentioned for consideration by the joint committee proposed, if thoroughly investigated, will be better understood by the public, and the investigation will therefore in all probability enable Congress, with the approval of the people, to settle these questions to the best interests of the public."

The general survey committee of the United States Independent Telephone Association, it is presumed, will study the situation and report to the board of directors with its recommendations. When it is realized that the recommendations thus presented by the committee will, in a great measure, determine the policy to be pursued by the association, the importance of its work will be appreciated.

Right to Protest Chicago Automatic Sale Denied.

Otto Cullman's injunction suit seeking to prevent the absorption of the Chicago automatic telephone system by the Chicago Telephone Co. virtually was thrown out of court last week. Attorney William P. Sidley, counsel for the Chicago company, asserted that Cullman, who resides at 5400 Wayne avenue, had purchased stock in the Chicago Telephone Co. after the automatic plant was purchased. Federal Judge Landis upheld his contention that Cullman had no legal right to object.

Texas Pole Tax to United States Supreme Court.

The hard fought pole tax suit between the city of Dallas, Texas, and the Southwestern Telegraph & Telephone Co. is to go to the Supreme Court of the United States for final decision. A bond of $25,000 will be filed by the telephone company within a short time, an application for a writ of error carrying the case to the United States Supreme Court on federal questions having been granted by Chief Justice Anson Rainey, of the Fifth Court of Civil Appeals, in Dallas.

The case is one which has aroused considerable interest among telephone people of the Southwest. It grew out of an attempt by the city of Dallas to impose and collect from the telephone company an occupation tax on all its poles in the city, and on all wire mileage. Some two years ago the city passed an ordinance to that effect, imposing the

tax upon the Southwestern company. The Dallas Automatic company now pays to the city, and has paid since it began business, an occupation tax based upon its gross receipts. Upon refusal of the Southwestern company to make payment of the first year's charges, amounting to $14,348, the city filed suit, and it is this suit that is being carried to the highest court. A second suit his been filed by the city against the telephone company or the second year's tax, but this suit has not been pushed to trial, awaiting a decision in the first case.

The case has gone through the lower courts in Texas, and to the supreme court of that state on application for a writ of error, which was refused. Eleven assignments of error were made in the application for a hearing by the United States Supreme Court, setting out five federal questions. These points were as follows:

Alleged impairment of the contract of the city with the company; alleged discrimination, it being charged that the proposed tax would amount to three times as much for the Southwestern company as another company pays, for the use of the city street; alleged erroneous construction by the court of appeals of a section of the state constitution dealing with reserved power; alleged erroneous application of this section and alleged erroneous construction of the city charter, in which the court of appeals held the legislature had conferred the reserved power on the city of Dallas.

City Attorney Charles F. O'Donnell, of Dallas, would make no comment on the appeal of the case to the federal court, excepting that he believes the city will eventually win the suit in the supreme court, as it has already done in various state courts.

Discount for Prompt Payment Justified.

In what was known as the Clinton County telephone case, the Missouri Public Service Commission has declared that the proposed schedule of rates filed by the Clinton County Telephone Co., of Plattsburg, Mo., imposes no additional burden whatever upon the large majority of the subscribers who pay their bills when due and that the rates are just and reasonable. As no evidence was offered to sustain other charges which had been made in the complaint of John H. Anderson, et al., against the company, the commission ordered the complaint dismissed.

On February 26, 1916, the telephone company filed with the commission a schedule of rates increasing the residence rate from $1.25 to $1.40 per month; the business rate from $2 to $2.15 per month, and the extension wall telephone rate from 50 cents to 65 cents per month, with a discount of 15 cents for payment on or before the fifteenth day of the month for which service is given. A complaint signed by 25 subscribers was thereupon filed with the commission against the company opposing the proposed increase on a number of grounds, namely, (1) that the proposed rates would subject patrons to a penalty if bills were not paid as rendered; (2) that the rates would amount to discrimination in charges between subscribers; (3) that the existing rates were unreasonable and unjust; (4) that debts have been contracted not authorized by the company or its by-laws; (5) that the management of the company has been extravagant; and (6) that the proposed rates were unreasonable and unjust. Pending the determination of the case, the schedule thus filed was suspended by order of the commission.

Hearings were held and a thorough audit made of the company's books. The auditor's report did not lend support to any of the charges of the complaint.

Under the former schedule, the charges for service were due on the first of the month for which service was rendered. A substantial number of subscribers were delinquent in paying their bills, and in many instances the amount due for service was wholly lost to the company. For a period of several years the loss, by reason of uncollectable accounts, amounted to an average of about $300 per year, and there was overdue from subscribers at the time of hearing about $4,000. As a result of the failure to pay such charges promptly when due, the company was compelled to borrow money from the banks at the current rates of interest to meet its financial necessities.

The stock of the company is owned by the subscribers and was fully paid for with the exception of $6,150, and from the circumstances in evidence and the history of the company the commission had little doubt but that this sum was also paid either in cash, labor or property. The dividends received did not exceed 6 per cent. on the par value of the stock. The affairs of the company, the commission found, have been economically administered. The proposed rates were shown to be lower than the rates of many other telephone companies for similar service.

In its decision the commission said: "It is well settled law that a telephone company may allow a discount for prompt payment on its charges for service. Pond, Public Utilities, Secs. 219, 220; Cole v. Ft. Scott & Nevada Light, etc., Co., 1 Mo. P. S. C., l. c. 175.

The experience of the defendant in this case in the losses sustained on account of those subscribers from whom it has been unable to collect its bills, the delay in payment by solvent subscribers, and the cost of collection, fully justifies the adoption of such a rule."

Telephone Merger Under Consideration at Beaumont, Tex.

A merger of the two telephone systems in the city of Beaumont, Texas, is under consideration by the city authorities and local commercial organizations. The Southwestern Telegraph & Telephone Co. operates an exchange in Beaumont, and an Independent exchange is also operated there by the Beaumont Telephone Co., of which C. W. Emmer is manager. The merger plans as at present outlined contemplate the organization of a new company to take over the property of both the present companies.

Vice-President J. E. Farnsworth, of the Southwestern company, was in Beaumont recently to present the details of the proposed merger to the city council. The important features of the proposition are an increase of business rates from $4 to $5 per month, the erection by the succeeding company of a new three-story exchange and office building, to cost $25,000 to $30,000, and the expenditure by the succeeding company of some $150,000 on the reconstruction of the merged plant. Residence rates will probably be unchanged, remaining at $2 per month for direct line service.

Several months ago the city council of Beaumont passed a resolution requesting the management of the two telephone companies to present, if possible, plans for a merger. Vice-President Farnsworth, of the Southwestern company, stated that the companies would be able to agree on plans for consolidating the properties.

Beaumont is a city of some 45,000 population, in the southeastern part of Texas, near the coast. The famous "Spindle Top" oil district is located within a mile or so of the city, which has large oil and allied industries.

Dallas to Charge Telegraph Companies Street Tax.

Following a recent petition by the Western Union and Mackay telegraph companies to the city of Dallas, Texas, that they be allowed to occupy the streets of that city with underground conduits and wires, under rights from the Federal Post Roads act, the city will institute a charge of 20 cents per mile wire tax for the privilege, it has been stated by Street Commissioner Otto H. Lang, of Dallas. The tax, it is said, was included upon the recommendation of the city attorney.

Under the provisions of the Federal Post Roads act, and also under a state statute on the same subject, the city cannot refuse permission for the use of the streets,

since the lines are not intended for local business. Attorneys for the telegraph companies have contended that the city cannot charge a tax upon such occupancy; the city authorities maintain that these laws do not prohibit the city from charging a corporation for the use of its streets.

Dallas (Tex.) Merger Plans Postponed.

Reluctant to expend the sum necessary for a valuation of the two telephone systems in Dallas, Texas, pending the proposed merger, until the legal status of the city charter is fully known, the Southwestern Telegraph & Telephone Co., and the Dallas Automatic Telephone Co. have asked the city authorities that the matter be postponed for the present. The merger proposition was initiated by the companies about two months ago, and was apparently received with favor by the city. It was agreed that the first step should be a valuation of the two properties by Edward W. Bemis, of Chicago, at the expense of the companies, and plans had been made to undertake the appraisal.

It appears, however, that the city of Dallas voted upon certain charter amendments affecting public utilities franchises, on April 4, and the result of this election is still in doubt because of contests filed. The telephone companies do not care to undertake any change in their present status until they know the result of these amendments, and the future standing of public utilities companies in Dallas.

Location of Pole Involved in Damage Suit.

Alleged location of a telephone pole so that it obstructed the highway, is made the basis for a suit for $20,000 as damages for the death of Leon Pritchard Jackson, aged 5. Suit was filed by L. L. Jackson, administrator, against the Cumberland Telephone & Telegraph Co. in Memphis, Tenn. The boy was thrown from an automobile against the pole.

Lot Owned by Telephone Company Exempt from Taxation.

The Wisconsin State Tax Commission, in a ruling handed down July 10, held that a lot owned and used by the owner of a telephone company in connection with the operation and management of the business, which is reasonably necessary for that purpose, is exempt from local taxation.

Summary of State Commission Hearings and Rulings.

CALIFORNIA.

July 12: California Southern Railroad Co. filed an application with the California Railroad Commission for a certificate of public convenience and necessity to operate telephone and telegraph lines in the county of Riverside. The company states that it will be necessary for it to construct such lines in connection with its line of railroad and that it desires to utilize this construction as part of a larger system.

FLORIDA.

August 1: Hearing at Tallahassee relative to charge against the Marianna Telephone Exchange, Marianna, of alleged violation of section 3, chapter 6,525 of the Florida laws. The specific charge is that the Marianna Telephone Exchange is alleged on June 1 to have failed to keep in good condition and repair, the facilities, instrumentalities and equipment furnished by it, having disconnected its wire, or line at Alliance, Fla., from the wire or line of the Barfield Telephone Co., thereby discontinuing a service it had prior to June 1 been rendering.

ILLINOIS.

July 18: Hearing the matter of the application of the Niantic (Ill.) Telephone Co. for an order authorizing the issue of $3,000 of its common capital stock and the issue of $8,000 of its preferred capital stock, the issue of $8,000 par value of its first mortgage 6 per cent. gold bonds and authorizing the execution of its deed of trust to Walter Pritchett as security. Case 5,153.

July 19: Hearing on the application of the Massac County Mutual Telephone Co. for an order authorizing the issue of its capital stock in the amount of $2,500. Case 5,033.

July 17: Hearing on petition of the city of Peoria, by Corporation Counsel Richard H. Radley, to compel the Central Union Telephone Co. to reduce its telephone rates to subscribers in the city of Peoria. Cross petition filed by receivers of the Central Union Telephone Co. Case 3,043.

KANSAS.

September 12: Postponed hearing on application of the Missouri & Kansas Telephone Co. for permission to increase its rates at Wellington, Kan.

MINNESOTA.

August 3: Hearing at Thief River Falls in the matter of the complaint of the Red Lake, Eastern Marshall Farmers Telephone Co. against the Eastern Development Telephone Co. for discrimination in telephone rates within the village of Goodridge, Minn.

MISSOURI.

July 14: The Missouri Public Service Commission asked the Circuit Court of Cole County, Missouri, to issue an alternative writ of mandamus against the Citizens Co-operative Telephone Co., of Holland, Mo., alleging that the telephone company has failed to file with the commission a copy of its rate schedule.

July 14: In the complaint of John H. Anderson, et al., against the Clinton County Telephone Co., of Plattsburg, Mo., as to the reasonableness of a schedule of proposed rates, the commission held the rates impose no additional burden upon the large majority of subscribers who pay their bills when due, and it is satisfied that the proposed rates are just and reasonable. As no evidence was offered to sustain the other charges which were made, the complaint was dismissed. Pending the determination of the case, the schedule of proposed rates was suspended by order of the commission. Case 903.

September 18: Hearing in the matter of adopting a uniform system of accounts for telephone companies. Every telephone company in the state has been given notice that it will be expected to be present or to be represented, and to introduce any evidence necessary to assist in the promulgating of a uniform system of accounts for telephone companies. Case 937.

September 18: General conference in which representatives of all telephone companies in the state are to meet with the commission and to introduce all testimony and evidence required in the adoption of uniform rules, regulations and practice.

NEBRASKA.

August 1: Hearing at Curtis in regard to connection of toll line of Nebraska Telephone Co. terminating at Curtis with the Curtis Telephone Co.

NEW YORK.

June 5: The findings of the commission in the complaint of the Woodruff Hotel Co., of Watertown, N. Y., against the New York Telephone Co. as to connecting 30 additional telephone instruments to the private hotel in the New Woodruff Hotel in Watertown, N. Y., and as to rates, are summarized as follows:

While a telephone company will not be required to connect its wires with switchboards and instruments installed and owned by the subscriber, it will not be permitted arbitrarily to discontinue existing service through privately owned instrumentalities which were installed at the invitation and under the requirement of the telephone company, under its supervision and not shown to have become inefficient or to depart in any way from the standard equipment in use by the company.

A tariff rate is not shown to be unjust or unreasonable by evidence that it is greatly higher than a former rate established under competitive conditions and before the law subjected telephone corporations to public regulation.

A hotel private branch exchange rate is not shown to be unreasonable by evidence that the patrons of the hotel refuse to pay tolls on local calls and that the hotel bears the burden of such calls rather than lose its patronage.

A hotel private branch exchange provides economies in the way of interior service and should not be expected to yield to the hotel revenues sufficient to carry its cost.

Where a hotel had installed a telephone system at its own expense by invitation and under supervision of the telephone company, under a special contract made before the law subjected telephone corporations to regulation by the commission, it was held that a proper tariff for future service should be the regular tariff less a sum equivalent to interest on the present value of the system plus a suitable allowance for depreciation. Order No. 266.

OHIO.

July 18: Hearing held at Columbus relative to merger of the Bell and National telephone companies in Bellaire.

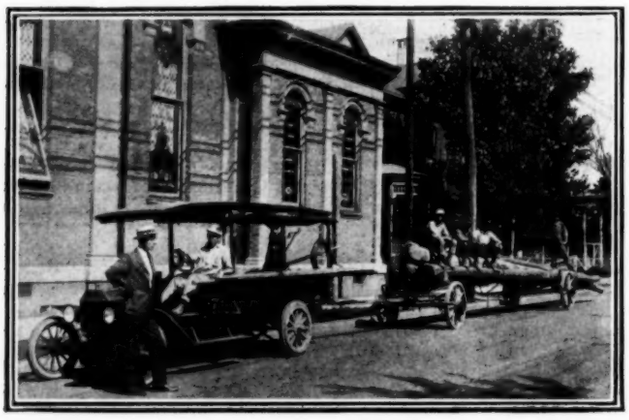
PENNSYLVANIA.

July 10: Application filed for approval of a renewed agreement between E. O. Leh, of Egypt, and the Bell Telephone Co. of Pennsylvania for the lease of 5½ miles of telephone circuit connecting the towns of Northampton and Egypt. For the past seven years Mr. Leh, representing the Egypt Rural Line Co., has leased this circuit, but due to a change in the laws of the state, the approval of the commission is necessary.

Practical Subjects—Letters and Discussions

Uses Motor Truck for Setting Poles.

By means of a motor truck, converted from a light automobile, and a block and tackle, used principally for setting poles, B. Y. Chambers, western district manager for the Central Home Telephone & Telegraph Co., at Paducah,



Motor Truck Used to Haul and Set Poles.

Ky., has succeeded in sharply reducing his outside maintenance costs. The truck, extended and made heavier, is chain driven, power being transmitted from sprockets on the old axles. A ring at the back end serves for attaching the end of the tackle and the truck engine applies the power required.

The illustration shows the manner in which the truck is employed continually, serving as a tractor as well as for other purposes. Ordinarily the construction crews number from six to eight men, but in the Paducah district new construction is managed by means of the truck and tackle with the foreman and as few as three men. Usually there is a convenient pole or tree or other object within a hundred feet, to which the block may be attached, or if necessary a small pole can be erected for the purpose. Three-sheave blocks are used and ¾-inch rope.

The success which has attended the use of this truck has decided the Central Home Telephone & Telegraph Co. to provide a similar truck which will be used in its toll line maintenance work. It will operate out of Louisville.

"Telephony's" Home Course for Telephone Men.

(Not meant for study.)

By Well Clay.

Ten thousand lakes lie gleaming
Beneath the summer sun,
In the state of Minnesota—
And there's fish in every one.

Of course you may not believe the latter statement if you have been so unlucky as to have fished in some of them, on the days when fish did not bite, but no one can dispute the fact about the number of lakes.

A lake may be full of fish but a fisherman, not familiar with the ways of fish and their haunts, might fish and fish and yet go home with an uncharitable idea of the lake as a fishing resort. Another may stumble onto whole schools of fish almost at once and have such good luck that the idea takes shape in his mind that he is "some fisherman." The kind of ideas we form about a thing all depends on the way things turn out.

Long years ago, I remember I officiated as first assistant to a farmer, on a "hill farm," where rattlesnakes were almost as numerous as the bed bugs. Sometimes it was hard for me to say which held first place in my affections. At night I thought the bed bugs were a little closer to my heart than the rattlers, but when I would carelessly tip over a shock of grain the next day, which had been pre-empted by a snake for a roof, I forgot the bugs, temporarily—almost entirely.

In those old days everything was done in the hardest possible way by hand. The corn was hoed, the hay all pitched with a hand fork and mowed away in the old-fashioned barns in the same retail manner. And say! but wasn't it hot work on those July days when the thermometer forgot itself. I have never seen anything that reminded me of it so much as a "hot room" at a Turkish bath when there are several customers ahead and one has to wait for them to be finished off before he can get out of the torrid place.

Nothing was done as nowadays. I am glad there has been improvement, because it seems to me I could not hop quite so lightly over the handles of a walking plough now as I did then—every time I ploughed out a nest of blue racers and they retreated across my bare feet. It scares me now to think that I used to go barefooted in such a country. I never could get used to snakes—that was one reason why I quit drinking, I suppose.

But to get to the reason for all this raking up of the old time stuff: Is it any wonder that farming did not appeal to me? The idea conveyed to my mind for a good long time afterwards when any one mentioned farming, was not an alluring one. Farming had not brought me joy—that is not unalloyed. It merely called up visions in my mind of disagreeable things.

One morning last week, as I was motoring in from the lake to resume the telephone business, I passed a farmhouse which was surrounded by a tidy set of farm buildings. The hour was very early and a clinging mist was just disappearing from the valley. The man who owned the farm was starting for the creamery with his load of milk cans and everything seemed to just ooze contentment and stability.

An automobile ahead of mine had stopped from lack of motive power, finally traceable to absence of the juice of John, and I had time to take in the picture while waiting for the other fellow to repair his loss—seeing that the road was narrow where he had stopped and I could not get past.

I received the farm proposition in an entirely new impression as I took in the make up of this farm plant. Here was a man who liked to farm and who had a farm that was worth while. Here was his home and here was where he was making more than a comfortable living. He had good machinery and good horses. He had an automobile under the shed; but being of frugal and sensible turn of mind, it was easy to see the well-used fertilizer disseminator had antedated the steed of Henry by several seasons. The big barn doors to the haymow stood open and one could see through the soft mist of the morning how inviting it would look to children on a rainy day.

This modern farmer did not have to pitch hay with a hand fork—not any. He did it wholesale with a team of horses, a rope and a hay fork. There was an apple orchard back of the house and a row of bee hives stood along the garden fence under their boughs. The war in Germany, the Mexican situation, and all the problems which come to vex those in the high places, were far away and untroublesome. All was well. In the evening the automobile would take them all into town in a few moments and the time would be spent at a picture show or listening to the band.

I saw the other side of farming almost for the first time in my life in a realizing sense—the goodness and the attractiveness of it. It appealed to me for the first time in my life and I was almost willing for awhile, if I had had the opportunity, to have traded places with him, so I could order him to come out and fix my "fone." He had a telephone.

Isn't this about what ails the telephone business? Are not some of us missing out on some of the finer points in the game because we do not see it in the right light. Are we look-

ing at it from the standpoint of a hired man, or as an owner of a fine opportunity to make good in the world? To us who are in the game it is, for the most part, the only apparent chance of making good and gaining a competence.

Are we gaining more than our pay? Are we getting more out of the job than the check which fleets from our vision so soon? Are we enjoying the scenery, the water and the woods, or are we only just fishing? Are we taking into consideration the habits of the patron and his likes or dislikes in the way of service (bait)? Are we taking the proper advantage of doing our level best while the wind is in the right direction—that is to say while public sentiment is favorable?

Do we try to land the new contracts deftly with the landing net of persuasion and keep them swimming in the right direction by the line of plausibility, or do we try to yank them over the side by main force? There is art, even in the "landing" of a dog fish. Do we go out in the morning merely to work, or do we go out to enjoy ourselves by performing a lot of useful labor in an interesting way?

Do we realize that we are in a business today that would have created amazement to the wisest men of the days of Aristotle. We are privileged to perform what would have been considered miracles in the days of the dark ages; and to perform these miracles, not as a special mark of appreciation from the gods, but as a part of our every day work. And we seem bored by the repetition of our amazing daily tasks.

APHORISM: It's all in the way one looks at it.

Let Her Drift.

By B. Franklin Oneliner.

When I was a boy, I read about

* * *

A man without a country.

* * *

I have a vivid recollection of pity felt for that man.

* * *

Much more worthy of our sympathy

* * *

Is a telephone company without a policy.

* * *

Did you ever know one? I have known several—

* * *

They thought their company was managed well enough,

* * *

But no policy or system could be detected.

* * *

If you are interested in a small telephone company

* * *

I would like to ask,

* * *

Has your company a definite and clear-cut

* * *

Plan of operation and management?

* * *

Or do you belong to the class which just drifts?

* * *

Possibly your company started some years ago

* * *

And just sort of grew up like Topsy.

* * *

Some of your methods stood the test

* * *

And proved to be good policy.

* * *

Others did not work out so well.

* * *

But, good or bad, you continued your methods,

* * *

Year after year.

* * *

If your rates were too low, or not properly equalized,

* * *

Did you have ambition and nerve to rectify this condition?

* * *

Or did you drift along

* * *

Trying to keep your patrons satisfied with the service

* * *

And at the same time

* * *

Keep the stockholders satisfied with the dividends?

* * *

How about the men who have charge of your exchanges?

* * *

Are they successful managers?

* * *

If not, why do you continue to keep them?

* * *

I know several local managers.

* * *

Whose work is not satisfactory,

* * *

And has not been for years.

* * *

But they are still on the job!

* * *

Some people have found out that it pays to specialize.

* * *

Let the troubleman shoot trouble

* * *

And the construction man do line work.

* * *

A switchboard man should do the switchboard work

* * *

A man who can qualify as a telephone engineer

* * *

Should plan the line construction

* * *

And buy the switchboards and equipment.

* * *

One company paid $1,000 for a switchboard

* * *

Which did not fit because

* * *

It was designed for a different kind of service.

* * *

This company would have thrown up its hands in horror,

* * *

Had any one suggested paying a telephone engineer

* * *

(Not a Western Electric engineer, however)

* * *

To help it buy a switchboard which was right

* * *

Instead of a $1,000 lemon.

* * *

Many men in high (?) places with little companies

* * *

Are like impedance coils—they oppose any change.

* * *

The same old policy is good enough for their company.

* * *

Let her drift!

Tax Valuation of Ohio Companies Increased.

The several hundred telephone companies of Ohio have, with few exceptions, increased their valuation in 1916, according to the Ohio tax commission, which last week made public its valuations, with comparative figures of valuations of 1915. The total valuation of telephone companies in the state recorded for 1916, is $78,073,250, an increase of $3,468,160 over 1915.

Included in the comparative valuations are these companies, the first figures representing the total valuation for 1916, the latter for 1915, as follows:

Ashtabula Telephone Co., $246,120; $237,250.
Cambridge Home Telephone Co., $111,330; $107,020.
Central District Telephone Co., $1,692,730; $1,584,970.
Central Ohio Telephone Co., $33,250; $31,830.
Cincinnati & Suburban Bell Telephone Co., $12,158,540; $11,036,300.
Central Union Telephone Co., $15,793,990; $15,350,160.
Cleveland Telephone Co., $8,000,000; $7,816,270.
Eastern Indiana Telephone Co., $1,070; $1,070.
Eastern Ohio Telephone Co., $39,590; $38,410.
Elyria Southern Telephone Co., $6,000; $8,140.
Elyria Telephone Co., $233,040; $226,400.
Erie County Mutual Telephone Co., $12,230; $11,500.
Hamilton Home Telephone Co., $221,990; $238,910.
Home Telephone Co., Chillicothe, $243,620; $243,620.
Home Telephone Co., Ironton, $56,840; $55,970.
Huron Telephone Co., $27,200; $27,000.

For Hot Weather Purposes

On Being Great—Canada at War

By J. C. Kelsey

The king is dead! Long live the king!

The wheels of a great railroad system stopped for just five minutes, and then began to click merrily on. The great man who had built this railway from a one-engine service to the use of thousands of engines has gasped out his life. He was truly great—in courage, hope, optimism and all things which cause men to conquer wildernesses, uncover ore deposits, and bore for oil in impossible places.

Yet his great handiwork did not die—it only stopped for five minutes, and began to whirl again under the guiding hand of another man, for no man is so indispensable that a railway should stop forever or even hours. No man is so indispensable to governments, corporations, or to any walk of life that his death will end everything.

A new man takes his place and the world is surprised to learn that affairs are conducted better than ever before. A successor is always better because he can build upon the foundation of successes or failures his predecessor may have made.

As I write, I am on a fast train. It is a hot and dirty train, and the fine precipitation of dust would be envy of a qualitative analysis laboratory. It is called the International Limited, and it carries a man from Chicago to Montreal almost in the twinkling of an eye.

Four years ago the wheels of this great railroad system stopped for five minutes. The great master mind which brought the Grand Trunk Railway out of the ruts, had given up his life. From the decks of the sinking Titanic, he had smiled his last good-bye to the wife he had placed in a lifeboat.

The Grand Trunk did not go out of business. It stopped for just five minutes. It kept on operating, its engines increased in size, its tracks became smoother and its trains ran nearer on time. After five minutes had passed, the master was forgotten for all ages.

Thus it seems that the greatest man who grows up on the earth's thin crust, can achieve but five hurried minutes' regard from men who chance to live on a few moments or years more.

It puts me in mind of the genius of the Bell interests; of the man whose ambition to monopolize the telephone world, both in operating and manufacturing—the man whose worldly ambition has thrust so many years of injustice and burden upon deserving men.

When this man goes to his reward, will the Bell telephone interests go out of business? Or will the bells stop ringing for five minutes, and then go on to their destiny?

It is safe to say that the bells will jingle merrily again and a few moments later the master will be forgotten. His successor will profit by his mistakes, prejudices and successes, and in turn will work a few years more for five minutes' adulation.

So many incidents teach us that men are not the greatest factors in life. Men have tried to stay the tide. They have tried to build towers to the heavens to carry on a dispute with the angels and have tried other and countless things equally fatuous and futile. They have tried to monopolize the necessities of life and have even tried to conquer the world. They have tried to teach that the word "impossible" does not exist.

Rockefeller dreamed of new economics. Baer spoke feelingly of divine right, and both went down before the ridicule of public opinion.

Yet in spite of repeated failures, we still have the spectacle of telephone men dreaming of monopoly in this humble and necessary walk of life.

They have spent millions and millions on the telephone tower of Babel, and are still willing to spend more. For what purpose other than to strike a blow at freedom of speech? Of all the things that has caused strife and bloodshed, freedom of speech is that thing. Yet we find a group of men striving to undo practically one thousand years of human effort.

If this much advertised ambition to control speech is not curbed, it is only a question of time until the outraged public will again assert itself and overthrow the whole false structure. And it is safe to say that the usual five minutes of mourning will not be allowed.

A steel monopoly, a railroad monopoly, and other monopolies much less complex, have been tried and found wanting. None of these was so close to the hearts of the people—nothing is so close as the telephone. No business is so easy to go into—no business is so susceptible to every form of hostility. The curious part of the situation is that some telephone men do not understand the telephone business better.

Speaking of monopoly, Canada has one. It is one which is worrying it, too.

You know how valuable nickel is, and you will recall that the submarine "Deutchland" expects to carry home beneath the waves as many tons of nickel as it can load.

Practically all the nickel in the world comes from Canada too. It is controlled by the International Nickel Co. which really belongs to the metal trust, which in turn gets orders from Frankfort, Germany. Thus one can see how so many unforseen things can happen in this world. Canada, asleep as to its rights, loyal to England, allowed an enemy country to actually own and ship this metal for her own destruction.

As some people are proud of the telephone trust, so has Canada been just a little bit proud of her nickel trust. In Ontario, practically all of the nickel of the world has been stored by capricious Mother Nature.

Many companies were organized to handle this metal, but gradually one by one sold to the trust. One by one the independent companies were bought up, and Canada was convinced that a gigantic trust of this kind was necessary to the life and welfare of the state.

Just as in the States, we hear much of the necessity of big business in order to compete in other countries. It is one of our monumental fakes that a business covering miles can be more efficient than one covering a block. And Canada fell for the big size talk until the war came. Then it realized that Canadian boys were being killed by products of its own hills and dells.

The German owners of the nickel trust had been storing the world's nickel in their own country. Today, the ambition of this country is to confiscate this great natural monopoly within its gates.

Had the nickel industry remained in the hands of the independents, or had the ambitious nickel trust been content to take its half or a little more, and let the independent live, a different story might be told today. Confiscation would be a different matter if many local concerns had been allowed to stay in business.

How nearly alike is it all to our telephone business. So long as Independents remain, there is a degree of protection given to the business. But when it becomes a grasping monopoly, it becomes the most helpless thing in the world.

Canada is at war. Every man, woman and child in that great

country has had some grief. The band of crepe is almost a national emblem. Every day the papers print long death and casualty lists. Their editorials consider little but the war, for little else counts.

Soldiers are everywhere, and are drilling in dead earnest. It takes six months of constant activity to entitle a regiment to leave for England. On every public square are recruiting stations—thrilling speeches may be heard at any time.

Whatever the price may be, Canada is finding itself. It has solved the munitions question and has performed the impossible. After the war, Canada will give America different competition from the past. Every shop is working night and day, each turn of the lathe meaning death or injury to an enemy.

War after all seems to be a battle of factories, which means thrift, energy, and other activities useful to the human race. War brings its surprises in economies, morality, and preconceived notions.

Curiously enough, the much prosecuted and prohibition-driven distillery has a most important place in national offense and defense. Alcohol is war's right-hand bower—and, by the way, Canadians pay 35 cents for gasoline.

Speaking of war overturning every preconceived notion, I noticed that every man in uniform wore a wrist watch. It was not long ago that a man with a wrist watch on was an object of pity and merriment. Yet the man who would dare to poke fun at one of those Canadian soldier giants for wearing a wrist watch would possibly never live to do it again.

No one can doubt the physical power of the Canadian army after an insight into the methods of examination and training of the men. War is truly what General Sherman said about it.

This war should teach the human race that balance is Nature's demand. Nations fight side by side according to size of the apparently predominating factor. Two equally sized and powered nations can have a family scrap, but the moment that one opponent rises out of it so powerful that it threatens to weigh down the balance of power, the others jump into the scale to even up.

So long as the human race exists, there will be national equilibrium, and subordinate to it, local business and social equilibrium. Monopoly disturbs business equilibrium and Nature sets out to correct it.

Men who set out to corner, to buy, or to control any article of merchandise or service, merely tilt the business world a moment, and after a struggle, are forced to let it back. In the meantime they work havoc and ruin to the individual. It is just simple war—many die that others might live.

I suppose it will be every thus, that new generations of men will rediscover panaceas, schisms, and schemes of conquest, and believe that the only reason they failed was that the old generation did not know as much as they.

Anyway it is hard for the world to learn anything new and forget anything old. Further, it is awfully hot.

MORAL: Does the world really move?

Civil Service Examination for Laboratory Assistant.

An open competitive examination for laboratory assistant is announced by the United States Civil Service Commission, to be held on August 23 and 24. From the register of eligibles resulting from this examination will be filled existing vacancies and vacancies as they may occur in this position in the Bureau of Standards, at salaries ranging from $900 to $1,200 per year, and vacancies as they may occur in positions requiring similar qualifications.

This examination is also scheduled in the fall manual to be held on October 11 and 12.

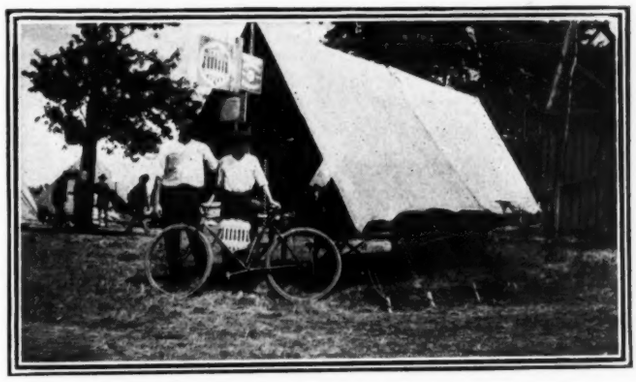
In addition to the basis subjects of the examination the following optional subjects will be given, in at least one of which the competitor must attain a rating of 70: 1. Advanced general physics. 2. Civil and mechanical engineering; 3. Electrical engineering; 4. Paper technology; and 5. Textile technology.

Persons desiring to enter this examination should at once apply for a copy of the Manual of Examination for the fall of 1916 and Form 1312 to the United States Civil Service Commission at Washington or any of its branch offices.

Independent Service at Missouri Mobilization Camp.

The Independent telephone toll station shown in the accompanying illustration is one of many stations located in the Camp Clark, Nevada, Mo., the mobilization camp of the Missouri National Guard. A complete telephone system was established in the camp and local and long distance service is available day and night.

The service rendered by the Kinloch Long Distance Telephone Co. and the Kansas City Home Long Distance



An Independent Toll Station in Camp Clark, Nevada, Mo.

Telephone Co. was highly complimented. The toll business was very heavy, but was handled very rapidly, which made the Independent telephone lines very popular with the troops.

Keystone Telephone Earnings for June.

The Keystone Telephone Co., of Philadelphia, Pa., has issued its comparative statement of earnings for the combined companies for the month ended June 30, 1916, and for the six months' period ended on that date:

	For Month Ended.		For Six Months Ended.	
	June 30, 1916.	Year Previous.	June 30, 1916.	Year Previous
Gross earnings	$122,365	$113,343	$718,233	$670,620
Operating expenses and taxes	61,815	55,242	358,861	331,406
Net earnings	60,550	58,101	359,372	339,214
Less interest charges	27,453	26,545	164,717	158,664
Net surplus	$ 33,097	$ 31,556	$194,655	$180,550

The directors of the company last week declared a dividend of 2 per cent. on the preferred stock on account of accumulated dividends. This is the third dividend of like amount declared.

Ordinance Relative to Height of Wires in Street.

A city ordinance, providing that it should be unlawful to construct or maintain any wires at a less height than 35 feet in the clear above any part of the authorized grade of any street, sidewalk, alley, or public place within the limits of the city, referred only to such streets as the city had established or authorized the grade of by some affirmative act; i. e., by ordinance or some other equally formal act, evidenced in writing, or by actual improvement—the ordinance being penal and requiring strict construction. Clark vs. Pacific Power & Light Co.; Supreme Court of Washington; 157 Pacific, 462.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

432. In what way does the cord circuit shown in Fig. 150 differ from those shown previously?

433. What is the difference between the differential relay principle and that of the double-wound relay sometimes used as the line relay?

434. Name one possible advantage in the two-wire multiple differential relay combination over an arrangement using the differential relay principle with a three-wire multiple.

435. Give another example of the use of the differential relay principle.

436. Explain *why* the special precautions shown in section 436 are necessary when manufacturing a double-wound relay, both windings of which are to be inserted in the sides of a working telephone circuit.

CHAPTER XIX. Typical Cord and Line Circuit Combinations (Continued).

437. *Circuit combination without relays in the cord circuit.*—There are a considerable number of common battery telephone offices in operation in which the cord circuit is so designed that no cord relay equipment is necessary for its satisfactory operation. In such cases the necessary transmitter battery supply currents are furnished through the windings of reactances which are a part of the line circuit equipment itself. Such a line and cord circuit is shown in schematic form in Fig. 153.

The cut-off relay, *B*, is a single wound relay with armature contact springs arranged to make one contact and to break another one. The line relay, *A*, is provided with two windings as well as with a non-inductive resistance, *X*.

438. *Combination line and supervisory relay.*—In the circuit shown in Fig. 153, the line relay, *A*, is provided with two separate windings. Through one of these windings the battery current flows to one side of the telephone circuit when a call is being made, and through the second one when it returns to the common battery from the other side of the line circuit. It is also to be noted that, in this arrangement, the line relay, *A*, is *not disconnected* from the circuit when the cut-off relay, *B*, is operated. When *A* is operated by the receipt of a call, its armature closes the circuit for the line lamp. This circuit is also under the control of the relay contact of the cut-off relay.

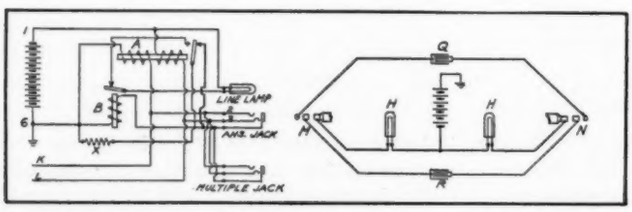


Fig. 153. Circuit Combination Requiring No Cord Circuit Relays.

It is proper to state, therefore, that battery current will pass through the two windings of the line relay going to the line and telephone and returning from it, whether a plug is inserted in the jack or not. Since no provision has been made in the design of the cord circuit for battery feed reactances, and since this double-wound line relay is bridged across the line circuit at *all times*, it is evident that the supply of transmitter operating current is fed to the line circuit through its windings.

The line relay, *A*, also places a ground upon the sleeve of hte line jack whenever its armature is released by the interruption of current flow through its windings. This ground is obtained through a small resistance coil, *X*, inserted in the wire leading from the grounded terminal of the common battery to the armature of the line relay, *A*. A moment's consideration of the arrangement of the cord circuit will disclose the purpose of this connection between the grounded terminal of the battery and the sleeve of the jack whenever the armature of the line relay, *A*, is released.

When the subscriber has his receiver off the hook, the line relay will be energized by the flow of current to and from the line through its two windings. When the receiver is replaced, it is obvious that the line relay, *A*, will be de-energized owing to the interruption of the current flow through its two windings. But whenever the line relay is de-energized, it places a ground connection on the sleeve of the jack. Should a plug be resting in the jack when this occurs, the supervisory lamp associated with the plug will be lighted. It will, likewise, be extinguished whenever the line relay, *A*, is operated by the flow of current through its windings.

439. *Illustration of a marginal condition in telephone circuit design.*—The statement might be advanced that a ground connection already exists on the sleeve of the jack by virtue of the permanent connection of the cut-off relay, *B*, one terminal of which is connected to the grounded side of the common battery. This is true and the arrangement is a very good illustration of a marginal condition in telephone circuit design.

The supervisory lamp, *H*, will not be lighted unless the line relay in whose line jack the associated plug is inserted, is de-energized, because the winding of the cut-off relay, *B*, has a resistance of 500 ohms. This resistance is too high to permit the passage of sufficient current to light the supervisory lamp.

When the line relay is de-energized, however, the path to the grounded terminal of the common battery from the sleeve

of the jack is comparatively low in resistance, 15 ohms, and the resulting flow of current from the non-grounded terminal of the common battery through the supervisory lamp, is sufficient to cause it to become bright. In other words, the line relay by the operation of its armature, causes the resistance of the circuit through the supervisory lamp to be made so high that the lamp is darkened. When the relay is de-energized, its armature creates conditions causing a marked reduction in the resistance of the circuit in which the lamp is included, causing it to glow.

At no time is the circuit from the battery to the supervisory lamp actually *broken*. The *margin* in the resistance of the supervisory lamp circuit between the condition when the line relay, *A*, is operated and when it is not, is sufficiently wide to provide satisfactory operating conditions for the lamp itself.

440. *Purpose of the resistance in line relay circuit.*—It would be a very natural query to make as to the necessity of the 15-ohm resistance coil, *X*. A little consideration will show that this resistance is still interposed in the sleeve circuit of the busy line when the line relay, *A*, is de-energized. Were not some resistance included at all times in the wire leading from the sleeve of the jack to the grounded terminal of the common battery, the line would not be guarded during the entire time that a plug rests in the jack. The line would be unguarded after the receiver had been replaced and before the plug was withdrawn.

Were not this resistance interposed, the diversion of all current from the winding of *B* when the line relay, *A*, is released, would inevitably destroy the busy test. A drop in potential between the tip of the testing plug and the sleeve of the busy jack is preserved by the flow of current through the coil, *X*, and the cut-off relay, *B*, in parallel.

441. *Variation in the strength of the busy test click.*—It should be noted that there is bound to be variation in the strength of the busy test click, depending upon whether the line relay is operated or normal. This is due to the variation in the strength of current flow through the sleeve of the jack of the busy line. In other words, the difference of potential between the testing plug tip and the sleeve of the busy jack is certain to vary, as the call passes through the different stages toward completion. This should be compared with the similar condition found in Fig. 138, TELEPHONY's Home Study Course for Telephone Men, section 354, April 1, 1916.

The extreme simplicity of the equipment required for the

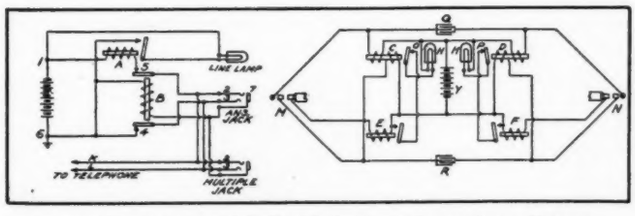


Fig. 147. Circuit with Double-Wound Supervisory Relays.

operation of this circuit is also to be noted. With no more relays than usual in the line circuit equipment, the entire operation of handling traffic is completed with *no relays* in the connecting cord circuits.

442. *Location of transmitter supply feed reactances unimportant.*—The use of double-wound relays, permanently bridged across the telephone circuit to control the line lamp, has been standard in the past with several of the switchboard manufacturers. In the circuit shown in Fig. 153, these double-wound relays serve not only as line and supervisory relays but also

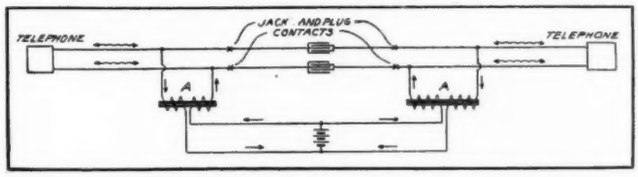


Fig. 154. Transmission Conditions for Circuit Shown in Fig. 153.

as the transmitter current supply reactances. It should be noted that the conditions affecting transmission, shown in the diagram, Fig. 154, are precisely the same as those that would be obtained by the use of the circuit shown in Fig. 147.

Should the diagram be drawn to represent the conditions obtaining in the circuit shown in Fig. 147, it would be necessary to place the small crosses representing the plug and jack contacts between the points of attachment of the relay wires and the telephones, instead of placing them as has been done. In other words, Fig. 154 shows that the battery feed reactances, *A*, are *outside* or on the line side of the contact points made by the plug and the jack springs, that is, in the line circuit equipment.

It should be very clear, therefore, that the actual location of the transmitter current supply reactances relative to the other elements of the line and cord circuit combination, does not in the least affect their value *as far as their employment as current supply reactances* is concerned. There are, however, some other considerations that *do* have a most important bearing upon the determination of the most advantageous location of these coils. It must be obvious that the permanent connection of the current supply reactances for the transmitters directly *across* the telephone circuit, is certain to have the effect, for instance, of reducing the strength of the ringing current reaching the called telephone. This is due to the shunting effect of the permanently bridged relay coils.

It is true that these coils may have such a high reactance for the high frequency telephonic voice-carrying currents as to prevent any serious transmission loss through their windings, and at the same time their reactance to the lower frequency ringing may be such as to make possible a considerable shunting effect. The reduction in *effective* strength of the ringing current delivered to the called telephone may be relatively quite considerable, without causing any failure in the signal. This is true because the original strength of the ringing current, in any given office, can very readily be increased to such a point as to more than offset the loss due to the presence of the bridged line relay coils. It is extremely difficult to suggest any method, however, that will prevent a sufficient flow of current through the windings of such bridged relays to cause the armature of the relays to vibrate or chatter in unison with the alternations of the current.

This violent vibration of the line relay armature, when ringing current is being sent out over the line, has been found to be one of the most serious objections to this general type of switchboard circuit. Under such operating conditions it

was found almost impossible to maintain a permanently satisfactory adjustment of the line relays. Forced to respond to calling current over the most diverse line conditions, normally, the rapid and vigorous vibration to which they were sometimes subjected by the leakage of ringing current through their windings, made their continued and reliable operation without attention very unlikely.

(To be Continued.)

Suit for Damages for Alleged Carelessness.

Damages of $10,000 are asked in a suit filed against the Southern Telephone Co. of Indiana, by Jennie B. Jolly, who states that on June 29, last, at the home of Mrs. William Schiller, in Jeffersonville, Ind., she was using the station at the request of the subscriber for a business purpose.

Neglect and carelessness on the part of the defendant, she avers, caused the instrument to become defective and she suffered an electric shock which threw her to the floor with such violence that she suffered internal injuries and impairment of the sight of her left eye.

Lincoln Company Loses Tax Appeal.

Judge Raper, of the district court at Tecumseh, Neb., has decided against the telephone company in the appeal case of the Lincoln Telephone & Telegraph Co. against Johnson county, Neb. The assessor turned in the property of the telephone company in Johnson county for the 1915 assessment at $172,300. The telephone company claimed this was excessive and made a return of $104,000.

The case was taken before the county board of equalization and the reduction denied. Appeal was then taken to the district court, and the telephone company again lost. The property was assessed at the same figure for 1916.

Personal Items of Interest to the Operating Field

GEORGE T. JONES, of Phillipsburg, Kan., has been appointed manager of the United Telephone Co., at Downs, Kan.

E. O. TURNER, of Davenport, Ia., interested in and associated with the Tri-City Automatic Telephone Co. for the last three years, has recently become president and general manager of the Pattonsburg Home Telephone Co., at Pattonsburg, Mo.

E. O. Turner.

Mr. Turner is a practical telephone man having started as an Independent operator about 15 years ago at Scottville, Ill. He built and then operated this plant for four years, after which he sold out and became associated with the Illinois Telephone Co. at Jacksonville, Ill. He remained at this point one year as foreman and was then promoted to manager at Whitehall, Ill., and a little later was given charge of the exchange at Roodhouse, Ill.

Under his management at these places, the exchanges were rebuilt and put in first-class condition. He remained with this company for about five years, when he resigned and removed to Tarkio, Mo., where he purchased one-half of the stock of the Tarkio Home Telephone Co., and held the position of president and general manager. Theo. Gary, of Macon, Mo., held the other half of the stock and was his partner. After two years he and Mr. Gary disposed of this property and Mr. Turner returned to the Illinois Telephone Co. and was put in charge of its exchange at Roodhouse, Ill. Later he again resigned and removed to Davenport, Ia., his present address. Mr. Turner has complete control of all the stock of the Pattonsburg Home Telephone Co., having purchased it from R. A. Guthrie, of Macon, Mo. There are said to be no better built plants in the state of Missouri, the larger cities excepted, than this plant. There are about 500 subscribers on this exchange, with good rates. Mr. Turner will remove his family to Pattonsburg within the next two or three weeks.

W. C. MOORE, of Cookeville, Tenn., has been made manager of the Glasgow Telephone Co., Glasgow, Ky.

S. J. BENNETT, of Waxahachie, Texas, has purchased the Minco (Okla.) Telephone Co. from J. M. Simpkins.

C. S. DITTMAN, for many years manager of the Downs, Kan., exchange of the United Telephone Co., severed his connections with the company on July 1.

E. C. WARNER, district wire chief of the Gainesboro Telephone Co., has been promoted to the position of district superintendent, with headquarters in Cookeville.

I. E. SPRANKLE, formerly manager of the Bell exchange at Lancaster, Ohio, has been made manager of the Youngstown (Ohio) District for the Central Union Telephone Co.

WYATT A. JENNINGS, district manager of the Southern Bell Telephone & Telegraph Co., for the past 20 months, severed his connections with the company on July 1. Mr. Jennings will take up insurance work in Raleigh.

S. C. POAGE, for the past six years division plant superintendent of the Southwestern Telegraph & Telephone Co. in the state of Arkansas, has been made general manager of the company in Arkansas, with headquarters at Little Rock.

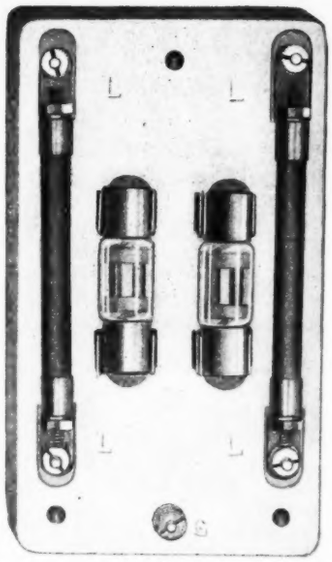
E. A. SANDERS has resigned his position as manager of the Youngstown (Ohio) district of the Central Union Telephone Co. It is understood that Mr. Sanders has accepted the local agency in Youngstown of the Fidelity Casualty Co. of New York.

S. A. LANE, for the past three years division commercial superintendent of the Southwestern Telegraph & Telephone Co. in the state of Arkansas, has been appointed general commercial superintendent for the state, with headquarters in Arkansas.

ROBERT L. SWANSON, owner of the Swanson Telephone & Telegraph Co., at Red Bluff, Cal., was united in marriage on June 25 to Ellen Grace Howard, of British Columbia. Mr. and Mrs. Swanson were the recipients of many beautiful and useful wedding gifts.

STANLEY R. EDWARDS, managing editor of TELEPHONY, was married on July 15 to Miss Katherine Ott, of Denver, Colo. Mr. Edwards, who has been associated with TELEPHONY for the past eight years, received the hearty congratulations of his associates, to whom his marriage came as a complete surprise.

G. E. Ross, who has been manager of the Northern Telephone Co., with heaquarters at Storm Lake, Iowa, resigned his position with the company July 1. The Northern Telephone Co. sold out to the Farmers & Merchants Telephone Co., of Hawarden, Iowa, on May 1 of this year and the duties of Mr. Ross will be assumed by B. H. Van Vliet, general manager of the latter company.



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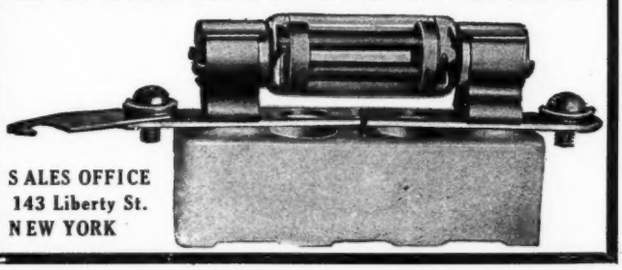

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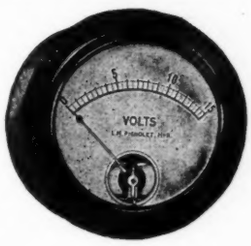
NEW YORK



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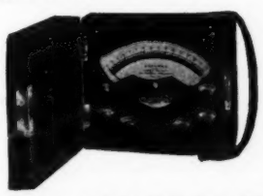

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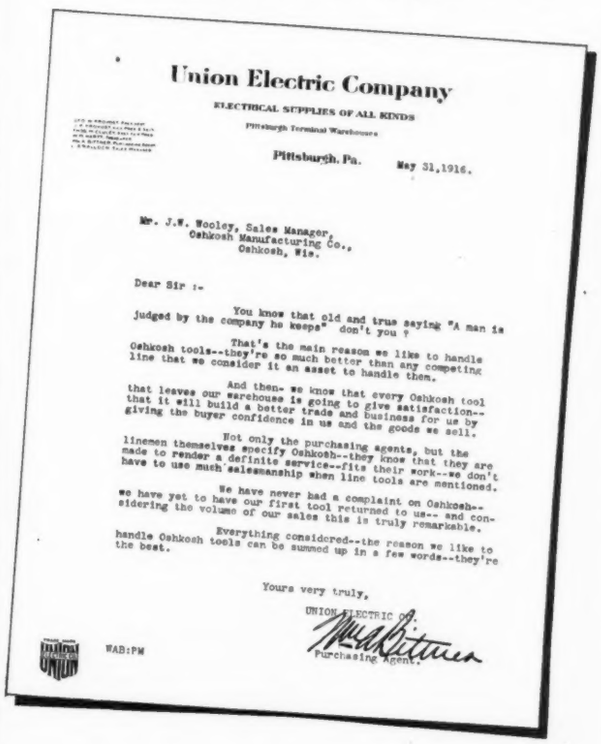

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New Companies and Incorporations.

BELLEVUE, IDAHO.—The Glendale Farmers' Mutual Telephone Co. has filed articles of incorporation. The directors the first year are A. W. Heckert, J. A. Jones, J. H. Little, all of Bellevue.

BELLE UNION, IND.—The Belle Union Teelphone Co. was incorporated recently with a capital of $2,000. The directors are Frank B. Allee, Van Buren McCammack, William Pickens.

HODGES, MONT.—The Farmers' Telephone Co. has been incorporated, and E. H. Murphy, Christian Forberg, K. O. Berven, Tom Harris and L. J. Berg have been elected directors. The officers are E. H. Murphy, president; Christian Forberg, vice-president; K. O. Berven, secretary, and L. J. Berg, treasurer.

SALISBURY, N. Y.—Articles of incorporation have been filed in the office of the secretary of state by the Salisbury Center Telephone Co. The corporation will conduct a telephone and telegraph business in Herkimer, Hamilton and Fulton counties. The capital stock is $10,000, divided into 100 shares of the par value of $100 each. The directors for the first year are: M. F. Wilbur, Robert H., Jesse R. and Electra C. Strough; Edward C. Fairchild and Will H. Corey, all of Salisbury Center.

GOLTRY, OKLA.—The Goltry Independent Telephone Co. was incorporated recently with a capital stock of $2,400. The incorporators are C. L. Preston, W. C. Nelson, C. E. Kisting, H. J. Storms and J. R. Vite.

FERNDALE, PA.—The Ferndale Telephone Co. has been incorporated with a capital of $5,000.

SCOTTDALE, PA.—The West End Rural Telephone Co. was incorporated recently with a capital of $5,000.

Construction.

DANVILLE, KY.—The Cumberland Telephone & Telegraph Co. has purchased a lot on Walnut street and will erect a modern telephone exchange and office building at a cost of $15,000.

BORDER, MINN.—The Border Co-operative Telephone Co. will extend its lines.

NEW ULM, MINN.—The New Ulm Telephone Co. has awarded the contract for the erection of an exchange building.

HOWARD, S. D.—The Nausen Telephone Co. will extend its lines in the near future.

PARIS, TEX.—The Southwestern Telegraph & Telephone Co. has purchased a lot, 54x108 feet, on East Houston street at the corner of Twenty-Second, and will erect a modern exchange on it. Work will be commenced as soon as plans can be prepared.

Elections.

CLARKFIELD, MINN.—At a meeting of the directors of the Clarkfield Telephone Co. H. P. Andrisen, George J. Piersol and W. C. Gough were elected officers.

ST. PETER, MINN.—At a meeting of the directors of the Nicollet County Telephone Company the following officers were elected: M. B. Johnson, president; W. G. Laumann, vice-president, and H. J. Essler, secretary.

ROSLYN, S. D.—The following are the newly elected officers of the Roslyn Mutual Telephone Company; S. J. Reed, president; Gilbert Gilbertson, vice-president, and O. O. Floren, secretary.

SISSETON, S. D.—At a meeting of the directors of the Roberts County Farmers Co-operative Telephone Co. the following officers were elected: Peter Permuntgen, president; Rudolph Miller, vice-president, and W. C. Oliver, secretary.

TIMBER LAKE, S. D.—The following have been elected officers of the newly incorporated Little Oak Telephone Co.: Simon A. Scherer, president; Peter Jacobson, vice-president, and M. H. Burke, secretary.

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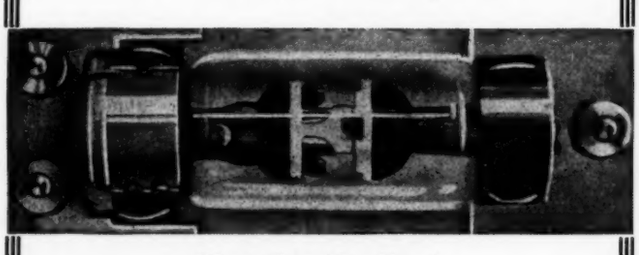

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